Photon

Issue 8

http://www.photonezine.com

Lunar Miscellany

MallinCam CCD Camera Review (Part 2)

The Odessa Crater

Science for Beginners

A Radio Telescope for Ireland

History of the Ashton-Wildwood Observatory

Google Earth Review

Meteorite Coin

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Editorial

Welcome to the eighth issue of **Photon**. As usual, my thanks go to all the contributors who took the time to send in material and photos for this issue.

Don't forget that thumbnails let you navigate better though the issue (only available in the complete issue PDF), using the tool in Adobe Acrobat Reader.

This issue has an eclectic mix of articles from astronomy-themed stamps to radio telescopes, a little astronomy humour and a review of the recently-released Google Earth software. I won't spoil things by giving you a quick synopsis of each article. Those teasers you see for TV programmes that tell you what's going to happen in tonight's episode bug the hell out of me, so I'm not going to do that here!

The Deep Impact mission was a resounding success in early July. The only downside was NASA not being able to get an image of the crater due to the amount of dust and debris thrown up by the impact. There's a page on my website dedicated to news on the mission.

Space Shuttle Discovery finally blasted off into space just a few days ago. Unfortunately, more bits of foam fell off the tank during its ascent and there's now some worry about whether any tiles on the Shuttle's underside or on its wings' leading edges have been damaged. Maybe it's time NASA called it a day on Shuttle. While I am a proponent of manned space exploration, the Shuttle has been something of a white elephant. Shuttle technology is 30 years old and it's due for retirement in 2010 anyway. Maybe it's better if the fleet is retired early in case another disaster happens. NASA might be better diverting support funding for the Shuttle into the development of the Shuttle's successor.

The Moon Landing's recent 36th anniversary reminded me that no human has been beyond low earth orbit in 34 years. 34 Years! As the man says: "If we can put a man on the Moon, Why can't we put a man on the Moon??"

Pretty much as I finished writing this column, the announcement of the discovery of the 10th planet in the solar system came in. 2003 UB313 is bigger and more distant than Pluto, but it's sparked a debate. Isn't it great to be involved in such an exciting hobby?!

Call for Submissions

Now that I'm paying contributors, maybe that'll prompt more of you to send stuff in. The closing date for Issue 9 is August 26th so you've over a month to put something together! If you've read the previous issues, you'll know the type of material I'm looking for. If not, the Submissions page provides some ideas, but things like book reviews, society profiles, equipment reviews and human-interest stories are what I'm looking for.

Don't forget that the ezine contains hot-links (underlined blue text) to external websites so, to get the most out of it, it's better if you're online when reading it. The links take you to websites that provide background information on the subject or to definitions of unfamiliar terms.

As ever, the ezine is peppered with little anecdotes and short story items. If you've come across any or something has happened personally to you, please let me know. If you'd like to remain anonymous - that can be arranged!

Night Sky Observer News

A number of new pages have been added to the Night Sky Observer site. These are mainly astronomy news pages from the likes of Eurekalert, NASA Watch, the European Space Agency and Deep Impact Mission news. In all, twenty such pages have been added. All are updated regularly with many receiving daily (or hourly) updates on breaking news. They're all available from the menu at the top of the Astronomy News page. Virtually all the pages on the website get daily updates at least.

LunarPhase Pro News

If you are a LunarPhase Pro user, V2.23 was released on July 1st, 2005. If you're not already using this version and you are using a V2.xx release of the software, you can download V2.23 via the ***Check for Upgrade*** button on the About screen. This release adds several new features to the software. V1.xx users can upgrade to Version 2 at:

http://www.lunarphasepro.com/support

V2.30 is currently in development and will feature some high resolution lunar maps with better feature detail than the highest resolution maps currently available in the software.

If you're interested in selling any of my software through your website, I've partnered with RegNow to create an affiliate program that gives a 30% commission on sales. There's also an option to become an affiliate through PayDotCom which pays commissions into your PayPal or StormPay account. Details at:
http://www.nightskyobserver.com/NSOaffiliate.html

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For up-to-date news on astronomy and space:
The Night Sky Observer

Lunar Miscellaney

By H.J.P. Arnold

The Royal Mail in the UK offers a service that enables us to customise stamps. It's called *SMILERS.* Since I buy new issue Presentation Packs from time to time if the subject of an issue appeals to me I received a leaflet about Smilers not too long ago. I did not, I confess, have more than a casual interest as I looked through the leaflet but then I noticed something which intrigued me. I must explain how the system works first of all.

Royal Mail has pre-designed about twenty stamps to which a digitised personal photograph can be added by the customer. The combined design is then printed by the Royal Mail. The subjects of the pre-designed stamps vary, for example, from a picture of Dennis the Menace (awful in my view!) to a simulated aircraft vapour trail which spells out 'Hallo' and on to a flower design which includes the words 'best wishes'. But the design which caught my eye was the colourful reproduction of a Union Jack against an attractive blue sky. Not only that but the title of this design was 'Rule Britannia'. I was delighted that the Union Flag was selected as a subject in a politically correct age where any form of national pride seems to be frowned on and even more so at the title selected for the design. I decided that I must order a printing even if the cost for twenty first class stamps - the minimum quantity that can be ordered at any one time - is a little over 2.5 times that of ordinary first class stamps. No matter – I wanted to fly the flag literally.

But what to include as my personal image? Most people to judge from the examples shown in the leaflet choose subjects such as portraits of near and dear or pets. It didn't take long for me to choose a recent astronomical image – one of the lunar eclipse that occurred at the end of October 2004. The preparation of the customised stamp is very straight forward and can be carried out (together with the actual ordering of the stamps) on the web.

The result can be seen in the illustration reproduced here. I was pleased with the result – the only drawback in my view being the white border around the edge of the eclipse image which makes it appear to be an obvious 'add-on'. If it were bled to the perforations this would not be the case but I was told that the reproduction process would not allow this. Nonetheless I have already had more of my very own (legitimate!) stamp printed and am thinking of following it up with another design – perhaps of the Sun in hydrogen alpha this time.

For anybody living in the UK who wants to examine the possibilities of producing a personal stamp have a look at: www.royalmail.com,/smilers.

The customised stamp. © sol invictus/hjpa

March 25th Full Moon. © sol invictus/hjpa

The Moon Awakes

The sub-heading is misleading of course – it is just meant as a rather ironic comment on the large number of evenings over the weeks of the late winter and early spring when the weather over my area of south central England at least has not favoured the keen astronomer or astro-imager. However there had to be some evenings when the sky was clear and two of my efforts are shown.

The first is an original digital image of the full moon of 2005 March 25th – Good Friday. Nothing unusual about the full moon, you might say, but this image does represent something special. It was taken at 20.59UT which was the exact minute (so Gary's splendid Lunar-Phase Pro software informed me!) when the moon was full. Often weather, or personal arrangements or timing (for example with 'fullness' taking place in daylight hours for a particular locality) can result in pictures of

April 18th Moon. © sol invictus/hjpa

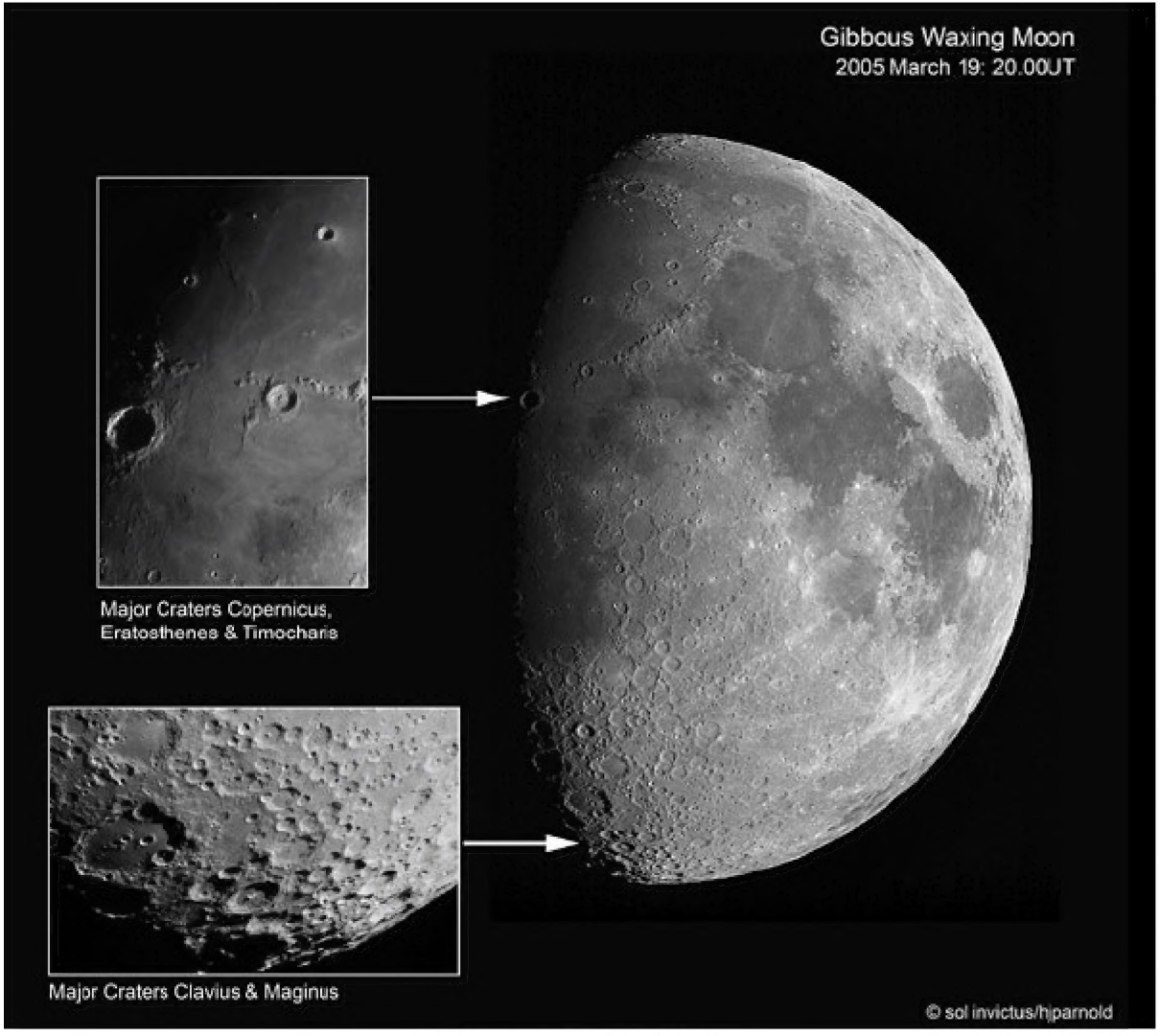
the moon only being within some hours of its being full. Usually this has been the case with my efforts and that is what makes the image shown here special for it is the only one I have ever managed to obtain when the moon was full to the minute.

For the technically interested, it was obtained at so-called prime focus of my Starfire f/9 178mm refractor using what is now a somewhat vintage Nikon D1 digital camera tethered to my observatory computer. The sensitivity was rated at the equivalent of ISO200, the exposure was centre weighted with aperture priority mode adopted. The exposure was 1/640 of a second. An image of the set up is shown at on the previous page.

The second image (above) was taken of a gibbous waxing moon on 2005 April 18th during a run of four evenings when the sky was largely clear. This time I was using a digital camera which, unlike the Nikon, is the current 'state of the art' – a Canon EOS 1Ds Mark II kindly loaned to me by Canon UK. The camera's sensor has a resolution of over 16 megapixels compared with the D1's 2.6 megapixels – quite a difference that reveals how far digital SLR cameras have developed in a short time. The D1's image measures 2000x1312 pixels, for example, compared with the 1Ds' 4992x3328 pixels – the latter's sensor being full frame. The control details chosen mirrored those of the full moon image but the shutter speed was 1/50 second.

Both images were shot as raw frames which were downloaded directly to the computer and were then manipulated subsequently in the respective cameras' editing software.

The final image (shot a little earlier in the year on 2005 March 19th – when the moon was within a few hours of the April 18th phase) [next page] is an example of how, with the various imaging programmes now available to us, we are spoiled in being able to present our efforts in an attractive form with almost no effort required. Photoshop was used here and only a few minutes were required to size and prepare the 'close in' views (shot using the Starfire and Eyepiece Projection through a 26mm Plössl) and to overlay them on the main gibbous disc view. The lettering took just a few minutes more and *voilà* – the job was finished. Our lunar forbears like Warren de la Rue would have been both amazed and delighted.



Mar 19th Moon. © sol invictus/hjpa

Alan Shepard: Moon Shot

"When Apollo 14 went to the moon, in 1971, it carried a rock-and-soil sampling tool that had a barrel grip and a cylindrical shaft three-quarters of an inch in diameter. Aluminum with Teflon O-rings, it was thirty-three inches long and consisted of six parts that could fit into one another to make the one shaft.

"Unbeknownst to NASA, the U.S. Navy astronaut Alan Shepard and a guy in the NASA machine shop took the head off a 6-iron and modified its hosel with a hexagonal fitting that would lock into one end of the sampler's handle. Shepard put the club head in a white athletic sock with two golf balls, concealed the package down one leg of his space suit, blasted off the big tee in Florida, and headed for the first at Lunarrama.

"After completing his duties up there, he assembled the golf club and pulled one of the balls out of the sock. Speaking on live television to the population of the planet he had left behind, and sounding just slightly like a barker in a sideshow, he said, 'In my left hand I have a little white pellet familiar to millions of Americans.' He said, 'I'm going to try a little sand-trap shot here,' and, like most golfers who routinely shoot bogey rounds, he offered an excuse beforehand: the space suit was inconveniently bulky - 'I can't do it with two hands.'

"He swung with one hand, four times. He whiffed. He nudged a ball a few feet. He shanked into a crater. And on his fourth swing he clocked one three hundred yards."

["I thought, with the same clubhead speed, the ball's going to go at least six times as far," Shepard recalled. "There's absolutely no drag, so if you do happen to spin it, it won't slice or hook 'cause there's no atmosphere to make it turn..." The shot remained aloft for about thirty-five seconds (compared to six for a long drive on Earth). Shepard left the balls on the moon but brought the club back and later gave it to the USGA.]

MallinCam™ Video CCD Observational System

by Jack Huerkamp

Portable DVD Player and video camera

Part 2

Dark Sky Test on a Large Scope

Prior to Deep South Regional Stargaze 2004, I had only used the MallinCam on my 6" refractor at F/5, my 8" f/4 Newtonian, and a friend's 8" Meade LX200 at f/6.3. I really wanted to see what was possible with the cameras under darker skies than my backyard and with a larger scope. At this year's DSRSG, I finally got the chance.

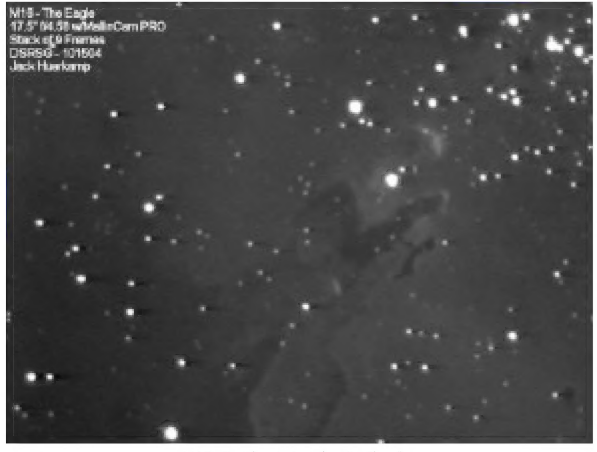
At this event, I used my 17.5" f/4.58 AstroSystems TeleKit with a Coulter primary mirror bought in 1981. To the TeleKit, I added a ServoCAT GOTO and tracking system, a laptop table, and a battery box. I did not have room for both the laptop and the DVD player on the table; so I had to forgo the laptop. I used the Argo Navis to guide the scope to all the targets I sought. (See my Brainless Astronomy 101 article in Issue 7 of Photon).

As there was no AC power on the observing field to run my 13" TV/VCR combo, I decided to try using a 7" portable DVD player to view the camera's output. I covered the screen with a piece of 1/8" red, transparent Plexiglas. I also used the Sony Hi-8 HandyCam seen with the DVD player to record the camera's output for later image processing.

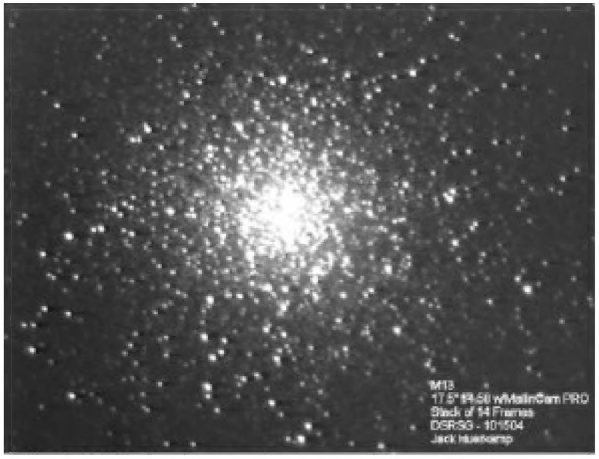
By moving the primary in its cell as close to the secondary as possible, I was **just** able to achieve focus with the MallinCam PRO. I could not achieve focus with the II Color. I need to trim off short sections of each truss tube and check to see if focus can be achieved. This will be done in the near future.

With respect to the combination of the PRO, 17.5" scope and the ServoCAT, the performance exceeded my expectations! One of the first targets I looked at was M16, the Eagle Nebula. The "Pillars of Creation" were easily seen. I had never seen this object with this level of detail in any scope before. The picture below is a stack of 9 frames using RegiStax and closely approximates the view on the monitor of the DVD player.

This was exciting and the crowd was beginning to form. I switched to an old favorite M-13. The center was totally over-exposed.



M16, the Eagle Nebula.

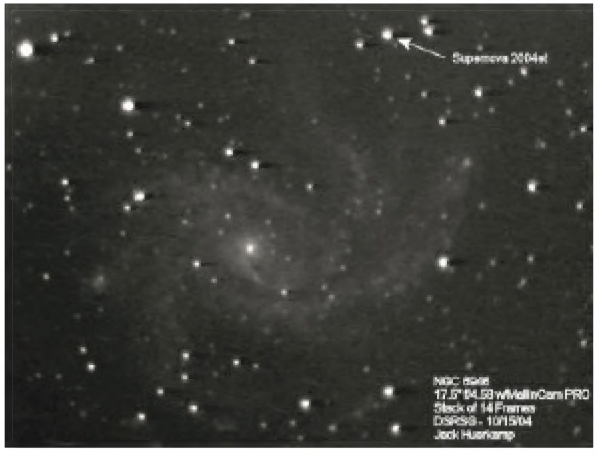


M13 Globular Cluster in Hercules

By varying the number of exposures and the gain, I could resolve stars across the cluster's center.

The Eskimo Nebula in Gemini

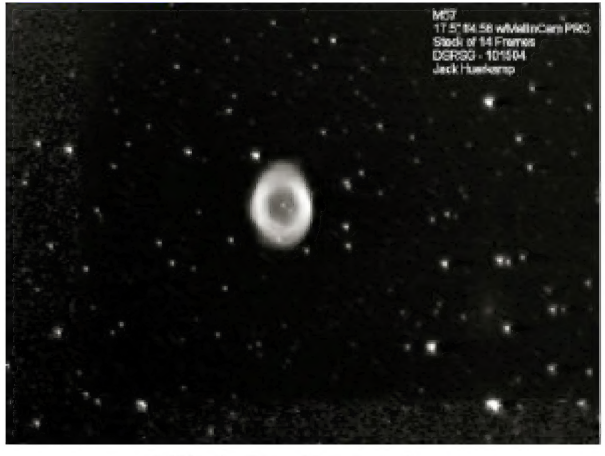
and looking at the monitor I could see an 18.9 magnitude star just outside the edge of the planetary.



NGC 6946 galaxy in Cepheus

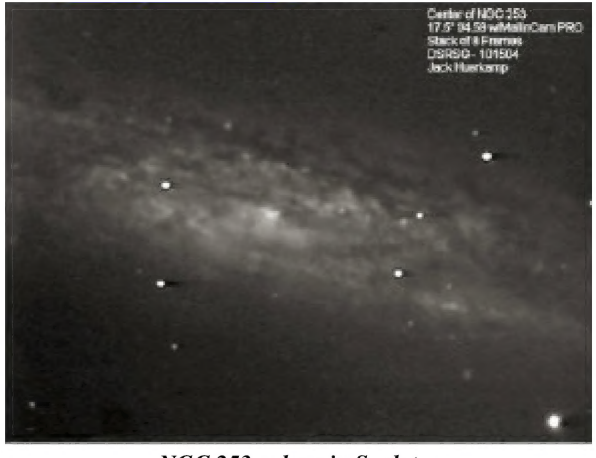
namesake's appearance.

M57, the Ring, revealed at least two stars in the center



M57, the Ring Nebula in Lyra

The Eskimo, NGC 2392, started to take on its

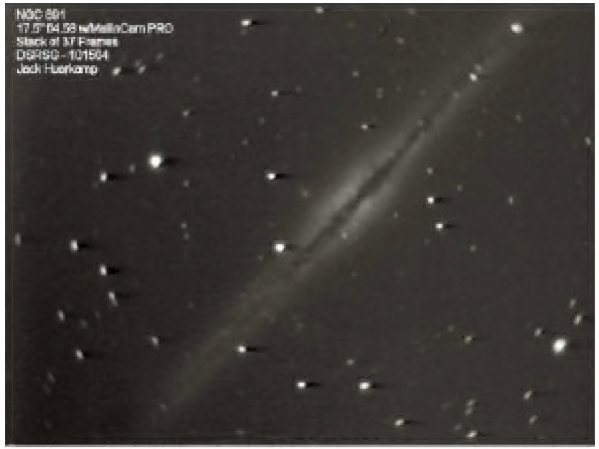


NGC 253 galaxy in Sculptor

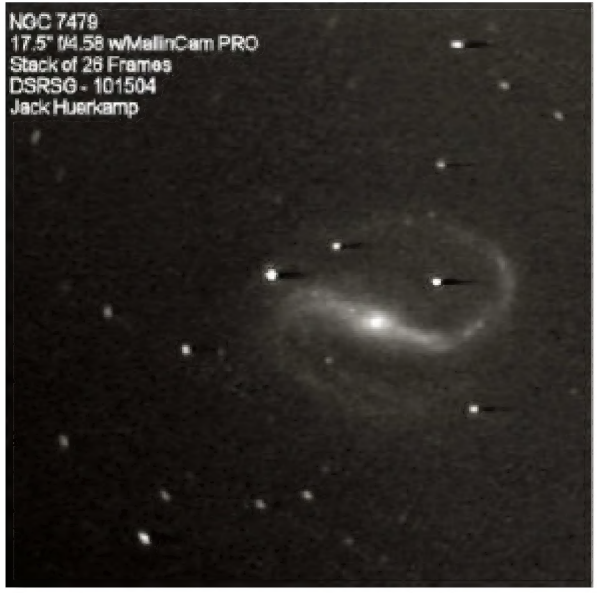
The camera performs like a 9mm eyepiece. Thus, in the TeleKit, the field of view was similar to what is achieved at 225 power. Thus, only a portion of NGC 253, the Sculptor Galaxy, could be captured by the camera.

By now there were about a dozen people all observing at the same time and seeing more on the screen than would be possible with an ocular and your eye. Someone from the Jackson club asked me to try to locate the supernova in NGC 6946. The ServoCAT slewed the scope toward it and the arms of the face on spiral drifted into view – along with SN2004et.

I had my copy of Burnham's Celestial Handbook with me, and I looked through them to find interesting DSOs to pursue. NGC 891 was high in the sky, so it was selected from the Argo Navis' internal database, and the GOTO command issued to the ServoCAT.



NGC 891 galaxy in Andromeda



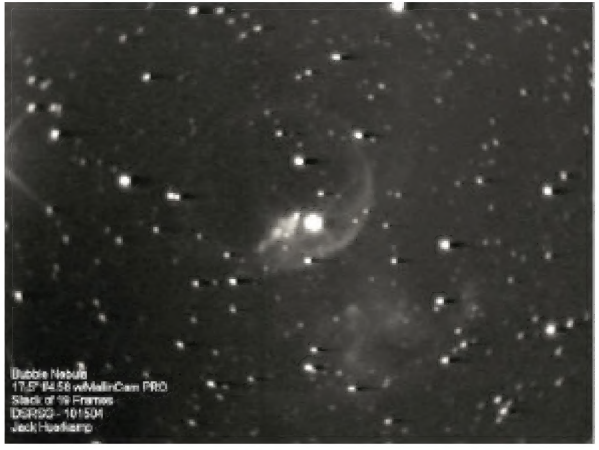
NGC 7479 galaxy in Pegasus

The galaxy drifted into view – extending diagonally across the screen of the DVD player. The dark lane showed lots of detail, varying in width and containing imbedded stars. This was one of my favorite objects of the stargaze.

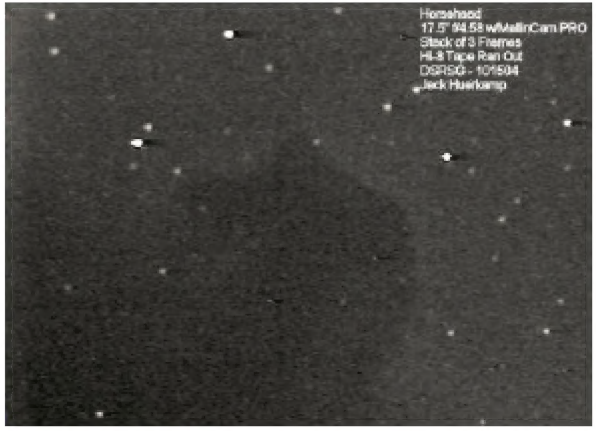
Another prominently placed galaxy was NGC 7479 in Pegasus. It is a barred spiral with a bright nucleus and two spiral arms. Together the galaxy looks like a backwards letter "S".

I finally ended the evening with two challenge objects – the Bubble Nebula, NGC 7635, and the Horsehead Nebula. The Bubble Nebula is a low surface brightness object that I have only seen a small portion of visually in the 17.5". The MallinCam equipped scope showed much more.

The view on the monitor was far superior to the picture shown here. There was much more subtle detail visible in the nebulosity to the lower right of the image



NGC 7635, The Bubble Nebula in Cassiopeia



Horsehead Nebula in Orion

than this stack of frames could capture.

With respect to the Horsehead Nebula, it is a large, dark nebula silhouetted against a bright one. The image shown is very grainy as it is a stack of only three frames. I ran out of videotape just as I started observing the Horsehead. Increasing the number of frames in a stack helps to increase the Signal-to-Noise ratio of the image. I will have to re-visit this target to get a better image of it.

For information on the MallinCam Video CCD Observational System, you can visit my website, and click on the link with the same name:

http://www.WaningMoonII.com

THE ODESSA CRATER

By Mark Bostick

The Odessa crater

In 1920, Virgil Graham, resident of Ector County, Texas found an unusual fist-sized rock. He gave it to a friend of his, Samuel R. McKinney, the first mayor of Odessa, Texas, who put the rock right to use as a paperweight in his office. Two years later, Arthur C. Bibbins, a geologist from Baltimore, Maryland noticed the "paperweight" in McKinney's office and recognized it as a meteorite.

Bibbins was there prospecting the region for oil and potash and after a little hunting, found a rancher who showed him a few more pieces of this "iron ore", telling him the rocks were recovered at the edge of a "blow out." The crater itself was first found in 1892 by a local rancher, Julius Henderson, who was searching for a lost calf, and was known by many of the locals.

When Bibbins made his way to the structure it was easy to see how it was dismissed as a blow out. He described the depression as "a few hundred feet in diameter"; the crater had become filled in due to time and nature and was only 10 to 30 feet deep. To the locals, the site was not so much of a crater, but rather a large bump of land that rose 8 to 10 feet off the ground. An important discovery would become overlooked by science for a number of years.

Bibbins noticed an outcrop of subsurface rocks that he reported as "steeply away from the center of the blow-out." Like surface features were found at Meteor Crater in Arizona, a similar structure that was also suspected as being a meteorite crater. Bibbins sent the largest sample of the meteorite to the United States National Museum were George Merrill analysed the meteorite and verified the find. Merrill's findings were published in the 1922 American Journal of Science. Merrill's article presented a chemical analysis and suggested the blowout might be a meteorite crater but he did nothing to investigate the area.

The largest known sample was in the national collection, so Merrill, who passed on his chance to play a key part in the discovery of Meteor Crater in Arizona, passed on his chance to investigate the "blow-out" and to be a vital part of it's history as well. For a number of years, the crater was ignored and forgotten by all but Bibbins.

During the 1920's, Daniel Barringer was attempting to mine Meteor Crater for a giant iron meteorite believed

7.7 kg Odessa Meteorite

at the bottom and made great effort to create interest, both in scientific circles and in the media using the cosmic origin he believed to be so obvious. Bibbins noticed this increased interest in terrestrial craters and wrote a letter to the Editor of Engineering and Mining Journal about the Ector County crater. In the letter, Bibbin's described the structure and it's rock outcrops rather well. He also noted the paper written by Merrill on the iron meteorite. A copy of the journal with this letter found it's way to Daniel Barringer during June of 1926. Barringer was greatly interested in the find, but was cautious in getting too excited. Arrangements were made and Barringer's son, Reau, was sent to Odessa with the instructions that "if it looked anything like Meteor Crater, get an option." A meteorite crater smaller than Meteor Crater would be cheaper to drill in and could supply scientific information as well as be possible profitable on its own and it could help get others interested in investing into his Meteor Crater project. Odessa crater could be nothing but good for Barringer.

Reau Barringer arrived at the Odessa crater on June 24 and telegraphed his father the same day, in code: "blow-out is a meteor crater". Barringer's son also told his father the blow-out was 500 feet in diameter, that he had found meteorites and was trying to purchase the land. A connection between this crater and Meteor Crater was more then considered by the Barringers.

The meteorites are both coarse iron octahedrite with silicate inclusions and look very similar. Daniel Barringer even went was so far to speculate that almost all meteorites found in North America, including the 34 ton Greenland meteorite, Ahighito, were from the small meteorite fall. Reau, under instructions from his father, quickly made a report to the Philadelphia Academy of National Sciences with the request that it be withheld from publication until further notice. This was to insure that Reau got proper credit for being the first to verify the crater's origin and to give the Barringer's time to acquire it. The land was owned by the Texas and Pacific Land Trust and was in a region of land rich in oil, gas and other minerals. Property price had increased a lot recently and they had no desire to part with any. After two years of effort, Barringer labeled the trust members as "hard-boiled hombres" and considered the negotiations futile.

E.H. Sellards inspects weathered, steeply sloping upper-Fredericksburg limestone exposed by trenching on the southeast side of the main crater.

Also during 1926, and unknown the Barringers, Dr. E.H. Sellards, a University of Texas geologist, was conducting research on natural resources in and around Ector County, when he found the Crater. Sellards noticed the structure was unusual and presented his findings during December in front of the Geological Society of America without coming to a conclusion. Instead, he offered five possible hypotheses to its formation, one of them being the fall of a meteorite. As for the meteorite theory he noted, "It is of course possible the occurrence of the meteorite fragments....is entirely fortuitous and without significance." Because of the problem in getting the Odessa property, publishing of Reau's paper was delayed two years. The scientific world was surprised to hear of the discovery but little was done to investigate it. In 1929, Barringer would die and interest in the crater died with him.

During the fall of 1935, Dr. Harvey Nininger arrived at the Odessa crater with his son, Bob. With them was a magnetic balance. This was a large, heavy and cumbersome early version of a metal detector. Better suited for a wheelbarrow than a backpack. Three years earlier, Nininger had visited the crater with an object he called a magnetic rake. A magnet attached to a metal rake that Nininger dragged behind him. With this rake he found 1500 small Odessa meteorites with a weight of 8 pounds. The magnetic balance had the ability to

Surface of the Odessa Meteorite

detect meteorites under the ground. Such an object had never been used to hunt meteorites before and was still very much in a signing age. Nininger was quite excited about the possibilities. Nininger was never good at electronics and Bob carried the machine as his father kept the long cord from getting tied up or tangled.

Toting the awkward object around, it is easy to imagine Bob's desire to take a break and have lunch. Nininger had declared earlier that they would not be eating until they found a meteorite and it was lunchtime when they started. As luck would have it, 15 minutes is all Bob had to wait till he got a strong signal and came to a stop. Nininger probed the spot and quickly uncovered a one-pound meteorite - the first meteorite ever recovered with a metal detector. The magnetic balance would undergo many changes before it would resemble today's metal detectors. But this trip would make Nininger a believer from day one.

They searched the rest of the day and much of the following morning. In total, 27 meteorites were found, adding up to thirty-four pounds. The largest recovered in the trip was eight and a half pounds, at the time, the largest piece known. Nininger made recommendations on ways to study and research the crater. He was sure that other meteorites could be found with similar searching methods and believed that a large meteorite might rest in the crater's bottom. Sadly, these recommendations were ignored and a different plan was set in motion.

Dr. Sellards had yet to put the crater aside in his mind and starting writing a series of academic papers on the crater and it's importance and urged fellow scientists to study the structure. One of the scientists that answered the call was Dr. Lincoln La Paz. La Paz was then at Ohio State University, but would be the director of the Institute of Meteoritics at the University of New Mexico. After visiting the crater, La Paz stated publicly that a meteorite, as big as 170 meters in diameter, might be at the bottom of the crater. It was still believed by many at this time that Barringer had found his meteorite treasure in one of his recent drillings. Reacting on the suggestions by La Paz and the possible profit to be made from the meteorite, the Ector County officials leased the land and started making plans to recover the meteorite and turn the site into a tourist attraction.

192 gram endcut of the Odessa meteorite, showing a large amount of silicated inclusions. This endcut came from a 7lb meteorite that was found by Ronald Hartman during 1964. The story about that meteorite hunt is featured in Rocks from Space by Richard Norton and Norton is shown holding the 7lb meteorite in his hand in one photograph.

The Humble Oil and Refining Company volunteered a magnetometer survey crew to help locate the meteorite. The government provided a small army of employees from the Works Progress Administration. Ector County, the University of Texas and the state of Texas contributed large funds of money for the drilling and building of structures. Sellards returned to the crater in 1939 with a crew of labourers and began excavation in hopes of finding the treasure deep in its bowels. A drill was sunk in the center of the crater and large trenches were dug to determine the course of the meteorite.

Fossilized remains of a long extinct Pleistocene horse and mammoth teeth were recovered, but nothing for good carbon dating was found. Many meteorite fragments were found during the work; specimens over 100 pounds was commonplace. "It may easily have exploded at the impact." Dr. Sellards would tell a newspaper reporter during the drill-

ing. "We have already found several fragments." But in early 1940, at a depth of 1,964 feet, the drill struck an object that shredded the teeth of the large drilling bit. Thinking that the large mass had been found, the workers began the second part of the plan.

Much like plans at Meteor Crater, it was decided to dig out rooms beside the location of the meteorite, and then tunnel sideways to view the stone. Adjacent to the drilling site, a large shaft was dug. The shaft design was simple. Eleven solid rock rooms, each deep enough for a man to stand in, connected by a series of ladders. It created a descending stairway that was both strong and large enough to hold the several workers. For the residents, the crater was a welcome distraction. Families would bring picnic baskets and enjoy an afternoon of watching the progress being made and hunting the surrounding plain for meteorites.

Slice of a breccia rock removed From the western rim of the main crater years ago.

When the workers reached the required depth, a shocking discovery was made. The drill had hit an unusual rock, but it wasn't a meteorite. Instead, a hard strata of limestone stared defiantly at the workers. There was no giant meteorite in the crater as Nininger and La Paz had suspected. World War II had been wrecking Europe for years and America's involvement in the war was a matter of time. After two years of studying the crater, Sellards and colleagues boarded up the shaft with wood planks and left the area. While they had failed to find the big one, magnetic searches uncovered three related smaller craters and many meteorites were recovered from inside these craters. Since this time, out understanding on the physics of meteorite impacts has increased and it is known that a small meteorite will withstand the force of impacting Earth more easily then a large meteorite. The force of a large meteorite fall is huge and it explodes and often, much is lost to evaporation. Sellards and the University of Texas collected almost six tons of meteorites in their search and excavation of the crater.

With the work credited to Sellards, he was considered one of the top impact structure experts in his day. However, many then and since have criticized his research methods. When the shaft was sunk, the excavated rubble was piled around it and the digging was done without concern and no record the different soil levels was kept. Large holes were dug into the crater and it's surroundings and were left unfilled. No careful study was done to the crater itself to reveal its structure. The operation was similar to a wild dig for the toy at the bottom of a Cracker Jack box, at the cost of spilling most of the caramel covered popcorn on the floor. After viewing the damage done to the structure, a well-known Texan meteorite collector, Oscar Monnig, would nickname the crater "Oh desecration!"

Youths acting as vandals and scavengers continued to tear up the crater until the problem came to the attention of the University of Texas Memorial Museum. A local committee formed to consider the best way to protect and develop the site. Interstate 20 lies only two miles from the crater and the site had the potential to be a tourist attraction. Calling themselves the Odessa Meteor Crater Task Force, they fenced off the main crater, built a small museum that showed several large meteorites from the crater and constructions were made so that people could look into the crater without entering it. There were doubts as to its tourist potential and when interest and funds faded, these plans were abandoned. Once again the crater was to fend for itself. The shaft was opened and entered by a number of curious young locals. One of these locals started a fire in the shaft and the county responded by cementing off the hole.

The 1960's brought the space age and with it, some local interest was revived, but all did not feel this. Although it was designated as a national landmark in 1965, many of the locals did not recognize its importance. The crater was used as a dumpsite for a number of years and was trashed with beer cans and graffiti by young adults. The museum was broken into and the largest meteorite samples were stolen. The crater was put on the list of endangered historical sites by the United States Department of Interior and National Park Services. The county officials tore down the museum and replaced it with a tin roof structure. A large picnic

table was bolted to the concrete and it was considered finished. Upkeep meant the occasional mowing of weeds and even the picnic table would find itself under attack, as someone sawed off its legs and made away with the table.

1997 brought the first relief to the crater; county officials matched a $7,500 grant to fix up the site. While this was small fund, it did let the county clean up the site, pave a road to the site, build a new picnic area and put up metal information signs. In 1999, a State Representative received a $500,000 state appropriation to build a museum and a caretaker living quarters. Just recently, the Odessa Crater has been put under the protection of the Park Services where it will continue to get the annual federal aid that it needs to maintain itself. One of a handful of recognized meteorite craters in the United States; the Odessa Crater has finally received the attention it has needed. The museum at the crater has a large display on the crater, the meteorite, and its impact and contains a collection of meteorites and earth rocks altered by meteorite impacts from around the world.

Odessa meteorites have an iron-nickel alloy that make up about 90 percent of the mass. Teantie and plessite (also nickel-iron minerals) account for most of the remaining material. Other minerals in the meteorite include schreibersite, cohenite, graphite, and troilite. The biggest fragment ever found weighs around 300 pounds. It is estimated that the incoming body, which created the largest of the Odessa craters, weighed about 625 tons and arrived about 50,000 years ago.

More than 100,000 cubic yards of crushed rock was thrown from the crater leaving a crater 550 feet across and 100 feet deep. The main crater was eventually filled to within six feet of the level of the surrounding plain. Over time, the crater filled up with soil and silt so that today it is only 15 feet deep at its lowest point. Shown on the previous page is a slice of brecciaed rock from the main crater. The breccia itself is a combination of impact melt and brecciaed fossiliferous country rock with bits of sandstone and limestone infused. A crater fill breccia created after the event from mixed excavated rocks washed back into the crater. Over time, the mixture cemented together.

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Loony Tesla?

Shortly before his death in 1943, the eccentric but brilliant inventor Nikola Tesla telephoned the U.S. War Department and offered the secret plans for a "teleforce" weapon which, he claimed, could knock planes out of the sky from a distance of several miles. The recipient, a certain Colonel Erskine, did not recognize his famous caller. Assuming that Tesla was clinically insane, Erskine promised to call him back and promptly forgot about him.

(Many believe that the mysterious explosion which flattened 500,000 acres of pine forest near the Stony Tunguska River in central Siberia in 1908 was caused by a test of Tesla's energy weapon. Though an expedition was made 20 years later to search for evidence of a meteorite, no impact crater was found; nor were traces of nickel or iron, the main constituents of meteorites, found to a depth of 118 feet.)

Stephen Jay Gould vs. New York Times

"In 1980, Luis Alvarez, Walter Alvarez, Frank Asaro, and Helen Michel published in the journal Science an article entitled 'Extraterrestrial Cause for the Cretaceous-Tertiary Extinction.' The Cretaceous-Tertiary extinction, which occurs at what is known as the K-T boundary... marks the sixty-five-million-year-old point at which the dinosaurs go AWOL from the fossil record...

"The Alvarez group determined that the K-T boundary clay had an anomalously high incidence of the element iridium. Since iridium is roughly 5,000 times more abundant in extraterrestrial objects than in Earth's accessible crust, it seemed clear that something cataclysmically extraterrestrial in origin [an impact with a comet or asteroid] occurred at the K-T boundary, an event that showered Earth with the element. These findings were attacked for several years, leading the New York Times, in 1985, to issue a now famously dyspeptic editorial. 'Astronomers,' the Times scolded, 'should leave to astrologers the task of seeking the cause of earthly events in the stars.'

"Stephen Jay Gould brilliantly ridiculed the Times by writing a fictitious editorial dated 1663: 'Now that Signor Galileo... has renounced his heretical belief in the earth's motion, perhaps students of physics will... leave the solution of cosmological problems to those learned in the infallible sacred texts.'"

Science for Beginners

by Michael Carroll

Best-selling author of "Ventriloquism for Dummies"

Lesson 3 – Astronomy

For those not in the know, we live on a planet called Earth. This planet orbits a sun called "The Sun" and is, in turn, orbited by a moon called "The Moon". They're part of a solar system known as "The Solar System" which inhabits a galaxy we call "The Galaxy", one of many different galaxies that drift about in a big empty space called "Space", all part of a universe called... Well, you get the idea. Clearly, our ancestors didn't have much imagination when it came to names.

But what, exactly, is a planet?

Simply put, a planet is a large, round ball of matter, sometimes – but not always – composed of a solid crust surrounding a liquid core, sort of like a spherical version of a McDonald's Apple Pie, with the obvious exception that only a very small number of planets bear the message "Caution: Filling is Hot".

What are planets for, then?

It would be tempting to answer "for generating and supporting life", but given that there's only one planet that we're aware of that *does* support life (i.e., Earth), clearly that answer is not quite substantial enough.

Now, some folk believe that the universe was created specially for us by a sort of all-powerful, eternal being, but since that way of thinking will take us down a different path – the one that puts the wishy-washy word "meta" before the strong, solid and quite dependable word "physics" – we'll avoid that for this lesson.

Astrologers would have us believe that the other planets in our solar system – despite being both rather small *and* far away – play some part in determining our lucky colours and whether we'll find new love on Wednesdays, but most proper scientists rightly debunk such absolute rubbish as nothing more than absolute rubbish.

If Earth is the only inhabited planet, that means that all the other planets (and stars and solar systems and galaxies, and – perhaps – the other universes) are pretty much useless...

Or *are* they?

Well, yes they are, at the moment. We don't yet have the resources to fully exploit the other planets. Annoyingly, all the really good resources – like iron and stuff – are buried pretty deep under the surface of the Earth. Even more annoyingly, out in space there's loads of asteroids that quite probably contain lots of handy minerals that would be a lot easier to mine, if only we could get there.

Unless some other race lays claim to them – which doesn't seem likely to happen in the near future –right now the best approach is to assume that the other stars and planets are "room for expansion". As a scientist, I feel compelled to take this approach, for the only other purpose the planets serve is to help make the night sky a little prettier. Though if *that* turns out to be their only reason for existence, I'll be annoyed: clearly, the designer of the universe was just making it up as he went along. If it was up to me, I'd have used the space for something more profitable, like a giant cosmic billboard or – better still – a great big telly. However, since sound doesn't travel through space, it would have to be a telly that showed only silent movies, and unfortunately all silent movies were crap (if they weren't crap, why aren't they still being made?).

So why are planets round? Why aren't they, say, cuboid or pyramid-shaped?

The answer to this one has perplexed scientists for centuries, and many theories have been put forth, mostly concerning that mysterious force known as "gravity". The truth, however, is actually rather straight-forward...

You see, the Earth is about 149.5 million kilometres from the Sun, and it takes a year to complete an orbit. Assuming for the moment that the orbit is circular (it isn't, but I don't know how to calculate ellipses), that means the distance the Earth travels in a year is (2 x Pi x 149,500,000) km. Which comes to a little over 939,336,203 km. The Earth has been around for about 4.6 billion years, which means that, so far, it has travelled about 3,757,344,812,000,000,000 km.

On top of that, since the Earth travels 149.5 million kilometres in a year, and there's 8,760 hours in a year (24 x 365), that means that the Earth is moving at around 107,230 kilometres per hour.

Now, even though space is called "Space", it's not entirely empty; there's all sorts of cosmic rays and meteors and space dust and stuff out there. After barrelling through this mess at over 100,000 kph for 3.7 quintillion kilometres, is it any wonder that all the edges have worn down? So to sum up, planets are round because of erosion.

Are there any other planets, apart from Earth?

Yes, there are! In fact, our very own solar system contains a total of *nine* planets, or ten if you count Sedna, which most reputable astronomers don't.

There are also planets orbiting other solar systems, but they are so far away that it's not likely any of you lot will ever get to visit them, so they might as well not be there.

Our local planets, though, are a lot more attainable. So far, we haven't really put much effort in; I mean, it's been over thirty years since the last manned mission to the Moon, and what have we done since? Crashed a few probes on Mars and Venus, and sent a handful of others to photograph the outer planets. The reason for this is tragically simple; governments won't invest in space exploration until they can see a way to make a profit out of it. The sad truth is that the human race spent more money visiting the failed Planet Hollywood restaurant chain than we've spent visiting actual planets.

Now, the planets in our solar system are, in order...

Mercury

Originally called "Mar-Curie", this planet was named after the discoverer of Radium, Marie Curie. It's the planet closest to the sun, and thus is very very hot indeed. It's even hot enough to fry an egg on the bonnet of your car, even at night.

Venus

Many, many years ago it was believed – on very little evidence – that Venus was a glorious world; a paradise. This we now know to be false; with its incredible temperatures and poisonous atmosphere, far from being Heaven, the planet Venus is closer to Hell. Sadly, those dreams of paradise have turned out to be nothing more than Venus envy.

Earth

The planet on which most of us live, Earth is the only planet in the universe named after something a gardener scrapes off his boots when he comes in for a cup of tea.

Mars

The famous red planet, except that it's not really red, it's more a sort of muddy brown. Mars is, at times, the closest planet to the Earth, and with today's technology it actually *is* possible to send a manned mission. But... All the signs indicate that Mars is a lifeless world, so the big question is this: "Should we bother?" It's probably the most important question in astronomy right now, and I know for a fact that there are all sorts of big, serious discussions going on, even though most astronomers seem to be pretending that no such discussions are taking place. Certainly, none of the scientists I interviewed for this article were comfortable answering my questions on Mars-Debating.

Jupiter

The largest planet in our solar system, Jupiter is a great big ball of gas. There's nothing much of interest there except for the giant red spot. Known in astronomy circles as "the giant red spot", this is something of a mystery. It's quite possible that some sort of aliens live there, though not likely.

Saturn

Known as "the one with the rings", Saturn is another great big ball of gas. It'd probably be pretty cool to be on Saturn, especially when the sun dips below the rings; you'd get lots of shadows and stuff, and budgies would keep falling asleep thinking that it's night time. However, it's widely accepted among physicists that budgies would not be as useful on Saturn as canaries, which would be able to warn us if the gas was poisonous.

Uranus

It's a little-known fact that this planet doesn't actually exist; it was made up as an excuse to use a rude-

sounding name. In light of that, it's interesting to note that some wet-blankety astronomers insist that the correct pronunciation is "*Your*-annus", and not "yer-*a*nus".

Neptune

Another imaginary planet, invented by infuriated atheist astronomers in 1846 in order to scupper astrologers, on the grounds that if our destinies really are influenced by the positions of the planets, then the astrologers would have to completely recalculate everything if a new planet was "discovered". Luckily, the astrologers correctly predicted that the astronomers would do exactly this, and developed a get-out-of-jail-free scheme; from that point on, they included such handy ambiguous phrases as "may" and "might" into their prognostications.

Pluto

This, the outer-most planet in our Solar System, was discovered in 1930 (can it be a coincidence that this is the *very same year* that Walt Disney introduced his legendary cartoon character? I think not!) Pluto is so far away from Earth that it's completely frozen, which would of course make it an ideal location for a snow-boarding holiday. Sadly, the most recent scientific papers on Pluto suggest that the distance is so great that all of the snow-boarders' holiday time would be spent travelling.

Summary:

So that's astronomy, then. If you find the subject intriguing, you might like to invest great wodges of cash in an expensive telescope, which you can point at the night sky to see the tiny dots of light as slightly larger dots of light.

(The real) Astronomy for Dummies book

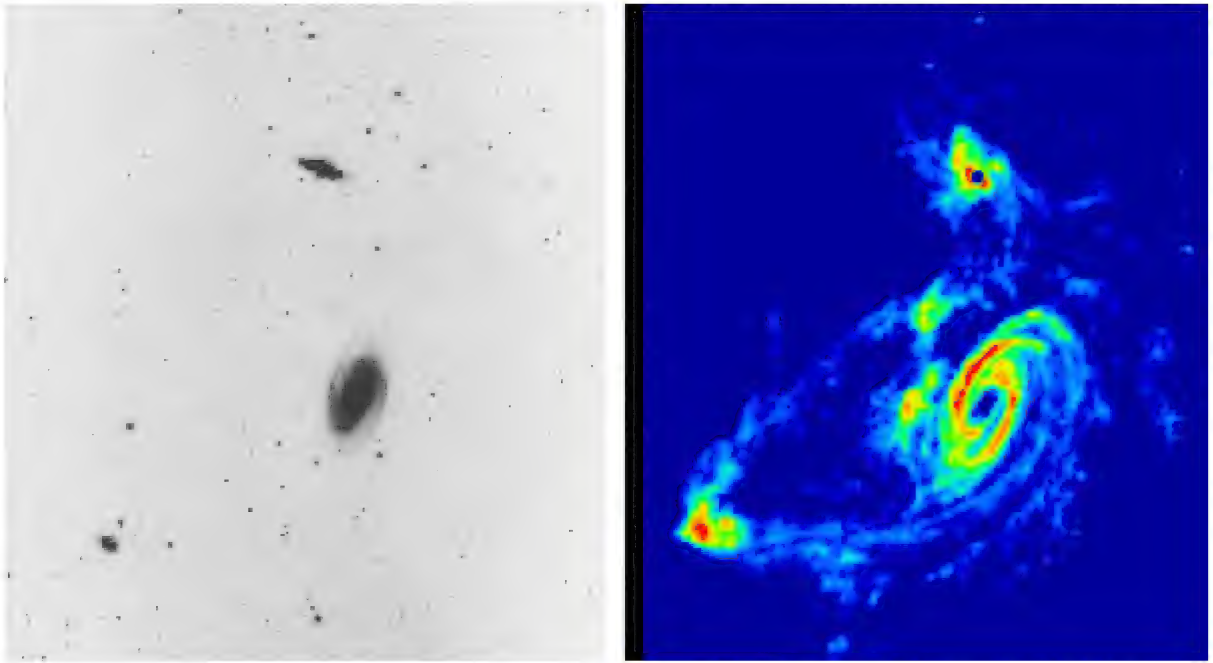
ARTI - A Radio Telescope for Ireland

By Kevin Berwick

Radio Astronomy

You can read this article because your eyes detect visible light. Light consists of *electromagnetic waves*.

The various colours of light such as red, green and blue are simply electromagnetic waves of different energies. Visible light, however, covers only a small part of the range of energies in which electromagnetic waves can be produced. For example, radio waves are electromagnetic waves of much lower energies than those of light.



Optical and radio images of galaxy M81. The radio image enables us to "see" structures that are not visible in the optical image. Radio image courtesy National Radio Astronomy Observatory, National Science Foundation (US)

For most of the history of astronomy, astronomers learned about the sky by studying the light coming from astronomical objects, initially by simply looking at the objects, later by taking photographs. In 1932, it was discovered that many astronomical objects emit radio waves. Since then, astronomers have developed sophisticated systems that allow them to image the radio waves emitted by astronomical objects.

Radio waves emitted by astronomical objects are collected using a parabolic dish, similar to a satellite TV dish, to focus the radiation on to a receiver. Using such a radio telescope offers a number of advantages over visual astronomy. Radio waves penetrate much of the gas and dust in space as well as the clouds of planetary atmospheres and pass through our terrestrial atmosphere with little distortion. Radio astronomers can therefore obtain a much clearer picture of some types of stars and galaxies than is possible by means of visual observation. If the radio telescope is part of a network of telescopes, the resolution of the telescope can be enormously enhanced using interferometry. This allows you to artificially create a 'virtual telescope' with a diameter equivalent to the distance between the individual dishes. Coordinated observing of this type using arrays of radio telescopes on Earth can achieve resolutions up to 100 times better than can be obtained with the Hubble Space Telescope. One advantage in particular is very relevant to us in Ireland viz. the telescope can operate day or night, rain or shine since clouds are transparent to radio waves.

Utilizing radio telescopes equipped with sensitive spec-

The 72 inch Birr Telescope after restoration, courtesy Birr Castle Estate (County Offaly in Ireland)

32m Cambridge Telescope of similar design to ARTI, courtesy Jodrell Bank Observatory, University of Manchester in Great Britain

trometers, radio astronomers have discovered more than 100 separate molecules, including familiar chemical compounds like water vapour and ammonia. In addition, the motion of astronomical objects can be studied using radio astronomy. A large number of celestial objects emit more strongly at radio wavelengths than at those of light, so radio astronomy has produced many discoveries of fundamental importance in the last half-century. By studying the sky with both radio and optical telescopes, astronomers can gain a much more complete understanding of the processes at work in the universe.

ARTI

ARTI (A Radio Telescope for Ireland) is a project to construct and operate a state-of-the-art 32m diameter radio telescope at Birr Castle in County Offaly. As many of the readers of this article will already know, Birr occupies an important position in the history of astronomy. During the 1840's and starting from virtually first principles, the third Earl of Rosse designed and had built the mirrors, tube and mountings for a 72 inch reflecting telescope which was the largest in the world at that time and remained so for three quarters of a century. With this instrument, Lord Rosse was able to study and record details of immensely distant stellar objects and to provide evidence that many of these mysterious nebulae were actually galaxies located far outside our own.

A radio-quiet site on the Castle grounds has been provided for the ARTI telescope by Lord Rosse. It is intended that the telescope will be used for cutting-edge research in radio astronomy, geophysics, and ionospheric studies. It's capability will be enormously enhanced by linking the Irish telescope with similar instruments in the UK and Continental Europe for inter-

ferometry, via the UK MERLIN and European VLBI network. Because of the Ireland's geographical location at the Northwestern edge of Europe, an Irish Radio telescope would be uniquely positioned to enhance the resolution and quality of radio images obtained via interferometry techniques.

It is intended that the facility would have other uses as well as for astrophysics. One interesting application of the instrument would be high-accuracy geophysical investigations of continental drift. The Earth's rocky outer crust solidified billions of years ago, soon after the Earth formed. This crust is broken up into huge, thick *plates* that drift on the soft, underlying mantle. So the map of the Earth is always changing. Since the ARTI telescope will be fixed to the ground, the 'drift' of Ireland relative to other countries with radio telescopes can be determined to a very high accuracy.

The telescope will provide world-class, hands-on training for young scientists, not only in radio astronomy and physics, but also in electrical engineering, microwave technology and information and communication technology. Involvement in primary and second-level education could be accomplished both through interactive, web-based projects and via visits to the telescope site.

Interest in the Sciences in Ireland, and the rest of the Western world, is waning and this is a source of concern among policy-makers here in Ireland, since science and technology act as powerful engines of wealth creation in this country.

Astronomy is one of the key Sciences which introduce young people to a career in Science and Engineering. The presence of a radio telescope dish of this size in the heart of the Irish countryside would be a real inspiration to many generations of school children, igniting interest in Science and Engineering.

The Plan

The complete cost for construction and outfitting of one 32-m telescope is estimated to be €10 million, with estimated running costs of ~ €300,000 per year. The design would likely be similar to the 32m Cambridge telescope in the UK. The possibility of constructing a second radio telescope in Northern Ireland, possibly at a site near the Armagh Observatory, is also being investigated and would extend the capabilities of the ARTI telescope greatly. The ARTI Consortium is currently actively seeking funding from a variety of sources both within Ireland and abroad. Possible sources of funding include the European Regional Development Fund (which has already funded telescopes

Giclee Art Print of the Very Large Array (VLA) Radio Telescope, U.S.A. 61 x 46 cm. Framing and mounting options available.

in the Canary Islands and Greece), Science Foundation Ireland (in connection with the ICT-related aspects of the project), Cross-Border Funding between the Irish Republic and Northern Ireland and corporate and private donors.

Further information: www.arti.ie

What's In A Star Name?

Some years ago, the main astronomical observatory in South Africa was located at Radcliffe near Pretoria. As Pretoria expanded, it was decided to move the observatory to Sutherland, about 800 kms away in the middle of the Karoo desert.

In memory of the institution which had previously resided there, the streets of a new housing suburb in the area were all given astronomical names, such as Rigel, Jupiter, Eridanus, Bootes, Carina and Canopsus.

Canopsus?

This error was quickly pointed out to the local council, who said that it was most unfortunate and that they had already made up the street signs and had already informed the map-makers that this was the name of the street - they then wondered, seeing that they had all these problems with renaming the street, wouldn't it be easier to rename the star?

The story was related by one of South Africa's most revered amateur astronomers, who is not given to making up tales or passing on urban legends!

The new motorized domes.Year: 1998

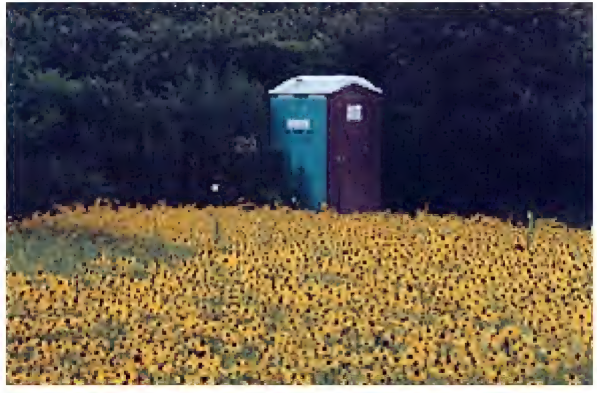
Ashton Observatory History Continued (See Issue 3)…

1998

1998 saw several Des Moines Astronomical Society (DMAS) members travel to the Caribbean to observe a total solar eclipse. Several watched the cosmic show from the beaches at Aruba, a few others chose to sail the sea and watch from the deck of Carnival's Fascination ocean liner. The club hosted The North Central Regional Astronomical League Conference, dedicated new motorized Ash Domes, had a member's photo featured on NASA's "Picture of the Day" web-site, and was graced with the first porta-potty awarded to the observatory by the county. It was a banner year.

1999

1999 brought a slight respite in club activities, highlighted by an in-kind donation by The Fred Maytag Family Foundation of over $30,000.00. The donation matched the gift awarded by the Roy J. Carver Foundation for purchase of new domes, but was not restricted to this goal. The observatory committee immediately began researching plans for the newly acquired funds,



First ever porta potty and wildflowers at Ashton. (1998)

Bryan Butcher and Joanne Hailey by the new 12.5" Ritchey-Chretein scope (1999)

and arrived at a decision to purchase a new telescope, mount, and solar observing equipment. The telescope of choice was a 12.5-inch computer-aided Ritchey-Chretien built by Optical Guidance. DMAS continued to hold annual fundraising activities, and in 1999 featured a book sale at the Des Moines Botanical Center.

1999 also featured society member Brian Ritchey catching a 737 flying by the sun during the Mercury transit, and member Keith Jamison being interviewed by The New York Times.

2000

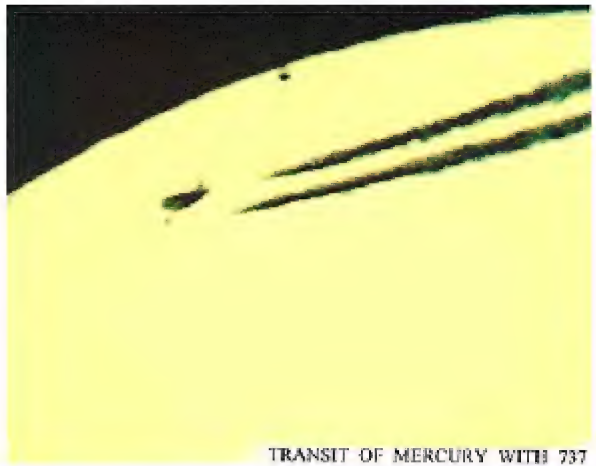
In January of 2000 shortly after the beginning of the millennium, DMAS hosted its first "Telescope Night" at Drake Observatory in Des Moines. The program featured talks by members and hands-on instruction with attendees on how to use their personal telescope equipment. The night was a success with many members of the public learning how to enjoy the night sky with their telescope.

In September of 2000 Joanne Hailey, DMAS Secretary was elected to the office of Treasurer for the Astronomical League.

2001

In 2001 an idea sprang forth to begin the fundraising, and construction plans for a new classroom at Ashton Observatory. Mailings to prospective donators, fundraising activities, and a drawing by then president Bryan Butcher, propelled the idea forward…creating a fever pitch in the society to realize a dream considered many times in the past. Once again The Fred Maytag Family Foundation came to the rescue of the society, and was surprisingly matched by Jasper County. The county matched the funds donated by The Fred Maytag Family Foundation to the sum of $20,000. Within six months, enough funds were raised to begin construction on a new 30' x 30' classroom connected to the old classroom built in 1983.

As the observatory building was getting bigger, so were the ambitions of society member Jim Holloway. Jim constructed the largest home-built telescope in Iowa, "Titan," with an optical diameter of 31-inches.



1999 Transit of Mercury

This is Titan....the telescope Jim Holloway built. Standing beside it is Brian Ritchey, one of our club members I think Brian superimposed the little coyote on there!

Titan was of Dobsonian design, and wowed every member of the public, and fellow stargazers, who had the unique opportunity to climb the ladder and look through it. Unfortunately, Jim was involved in a serious car accident in April 2001 and the fate of Titan was unsure. Jim's eye sight was questionable, and his ability to manipulate the huge telescope was in doubt. But by fall of 2001, Jim made a remarkable recovery and is still building telescopes to this day.

In November 2001 several DMAS members traveled to southern Minnesota to observe one of the greatest spectacles on Earth....a Leonid Meteor Storm. Clouds threatened viewing the predicted shower at Ashton Observatory, so at 11 PM several members climbed into four vehicles and headed north. A night full of bright fireballs, and intensities ranging in the thousands per hour, delighted the group till the early morning.

2002

After eight years, and many memorable moments serving as DMAS president, Bryan Butcher decided to take a break in 2002. Bringing the society together after an untimely break-up in 1994, to organizing the purchase of new domes, and culminating his eight year service with the addition of a new classroom, the always understanding, patient, and reconciling Mr. President stepped down from his post to relinquish the duties to new blood. The new blood came in the form of Doug Rudd. A man similar to Bryan in several ways; always smiling, always cordial, and he sported a ponytail....just like Bryan!

The new classroom addition to the observatory was completed in the spring of 2002, just in time for public nights. It was very gratifying to enjoy the spacious room for all society functions; public lectures, general meetings, and social gatherings. The best part for many, the new room was equipped with heating and air-conditioning!

2003

In August 2003 the observatory welcomed over a thousand visitors to gaze at the planet Mars. Our red neighbor was at its closest approach in over 3,000 years at a cozy distance of 35 million miles. Columns of people filed into the observatory to see details on Mars surface through both observatory telescopes, and many lined up at member telescopes stationed on observing pads. Bryan Butcher presented three lectures on the topic of Mars in one night! It was a memorable week at the observatory.

Dan Mortensen helping to build the new pads (2004)

Also in 2003 Ashton Observatory was cited as being one of the "10 Best Places to Go for Entertainment" by The Des Moines Register.

2004 - 2005

In 2004 new observing pads were placed at the observatory to accommodate the growing number of members with personal telescopes. The observatory also replaced the 12.5-inch Ritchey-Chretien telescope with a 16-inch Meade Schmidt-Cassegrain telescope, enabling high-tech functionality with simplicity to amateur star gazing. The observatory was also awarded $2,000 by the Maytag Innovative Fund for the purchase of audio/visual equipment which was purchased in early 2005. The addition of a video projector, sound system, and wireless audio capabilities have substantially enhanced the presentation of public lectures at the observatory.

Ashton Observatory is moving forward into the new century with innovative and user-friendly tools for accomplishing its mission. To serve the general public with contemporary information and insights to the world of astronomy, and provide a state-of-the-art amateur observing location for society members. Who knows what cosmic events await us in the future…but no matter what they are, The Des Moines Astronomical Society's Ashton Observatory will be ready to help unravel the mystery for the common human being.

The new 16" Meade Schmidt Cassegrain (2005)

ancient irish divisions of time - the months:

By James O'Connor

Following on from my last article, here are the derivations of the remaining months according to Charles Vallancey:

Antoine Court de Gebelin

July (modern Irish Iúil); August (modern Irish Lúnasa): Vallancey quotes the following from Gebelin's *Monde Primitif*: "For a long time these months were called *Quintilis* and *Sextilis*, that is, the fifth and sixth month; but, when Julius Caesar altered the Calendar, his name *Julius* was given to the first. That of *Augustus*, his nephew, was given to the second when he (Augustus) succeeded his uncle and had re-established the Calendar. From *Augustus* the French formed *Aout*."

Vallancey comments, "If the Irish had borrowed the names of the months from the Latins, they would certainly have adopted those of July and August; but we find no such names." (This implies either that *Iúil* wasn't used in Vallancey's day, or, if it was, that he considered it to be untraditional.)

He goes on to say that July is called *Buidhe-mí*, the yellow month, the colour of the meadows in this month, and *Mí-bó-bhuidhe*, the month of the yellow cow. Its synonymous name is *Mí-guarthag* or *Mí-guare*, i.e., the month of milch cows, from the abundance of milk given in this month. He adds that the Latin terminations of *Quintilis* and *Sextilis* seem to be derived from the Celtic *tille*, meaning a return or revolution, that is, the fifth and sixth revolutions of the moon from the beginning of the Roman year in March.

The Irish names given by Vallancey for August are *Ocht-mí*, eighth month, *Mí-lananas*, the month of bulling the cow and *Mí wadair* or *Mí-madramhail,* the dog month, from the supposed effect of the heat (or was it the dog star *Sirius*?) on this animal. He doesn't mention *Lúnasa* (or its earlier form *Lugh-nasa*) as a name for August.

Lugh was, of course, the Celtic sun god. An article by E.C. Krupp in the August 1994 number of *Sky and Telescope* discusses Máire MacNeill's book *The Festival of Lughnasa.* According to her, *Lughnasa* lost its fixed place in the Calendar (the 1st August) when the Church shifted many former pagan festivities to the nearest Sunday. However, it was preserved in the great August fair that coincided with *Lammas*, although St Patrick replaced Lugh as the patron of the feast.

September (modern Irish Meán Fómhair); October (modern Irish Deireadh Fómhair): Gebelin is quoted as follows: "The four following months had no particular names: some Roman emperors endeavoured to call them after themselves, such as *Tiberius* for September, *Livius* for October; *Germanicus* and *Domitian* made the same attempt. *Nero* would willingly have given his name to April, *Claudius* to May and *Germanicus* to June. *Commodus* gave all his names to the four last months, but the people despised these names, and adhered to ancient custom; and so they still continue to be called, viz., the seventh, eighth, ninth and tenth months, although they do not properly fall in that order."

Vallancey then comes in to say that "the impartial reader will now judge if the radix of the termination *ber* in September, etc, is not more properly derived from the Celtic *bar* (or *barr,* equivalent of Latin *Cal-*

endae) than from the Latin *imber*, as Priscianus and Isidorus will have it, in which case, as Vossius observes, *October* would more properly have been named *Octimber*."

In any event, the significance of *imber* in this connection is not apparent – the word means "shower" in Latin. The "m" in the names of the other three months obviously derives from the "m's" in "*septem*", "*novem*" and "*decem*", the Latin words for "seven", "nine" and "ten", respectively.

Vallancey goes on (writing, of course, in the late 18th century) – "Since the establishment of the English government in Ireland, the Irish have adopted the vulgar reckoning in these four months, as *Seacht-mí* or seventh month, *Ocht-mí* or eighth month; so they now have two months named *Ocht-mí,* one (October) after the vulgar reckoning and the other (August) after their own more ancient manner. But they have other names for September and October, more congenial to themselves. September is called *Mí-finnfoloi*, the vintage month and *Mí-meadhoin-fomharadh*, the middle month of harvest (or of autumn). October is called *Mí-sheasrí*, the plough month and *Mí-deireannach-d'fhomhradh*, the last month of harvest (or of autumn)."

November (modern Irish Samhain or Mí na Samhna): Vallancey gives the old Irish names of this month as *Naoi-mí* or ninth month, *Mí-dhu*, the black month and *Céad-mhí-do-geimhradh*, the first month of winter. He does not mention *Samhain* as a name for the month but says that November was sacred to druidical ceremonies and dedicated to *Baal-Samen,* which day now falls on the eve of All-Saints (1st November) and is called *Oidhche Shamhna*. On the first of November a fire was kindled to summon all druids to meet for the purpose of offering sacrifice to *Baal-Samen*. They burned the sacrifice in the fire, and no other fire was to be kindled in Ireland that night. All fires were rekindled from the holy fire, on paying a tribute to the chief druid. This festival was called *Tlachágha,* which signifies orbit. It was meant to convey the idea that *Belus*, the sun, had completed half its course.

December (modern Irish Nollaig or Mí na Nollag): The use of Nollaig or its earlier form, *Nodlaig*, Christmas, in the name of this month seems to be a comparatively recent development. Vallancey doesn't mention it. The Irish names that he gives for the month are *Deich-mí*, tenth month, *Mí-chru-mdu,* the most holy and black month and *Mí-meodhain an gheimhradh*, the middle month of winter.

According to Vallancey, December, like November, was sacred to druidical ceremonies. In December, the druids collected the sacred mistletoe with great pomp. He states that the Celtic word for the shrub is *íoc-gius* or *íoc-giul*, *íoc* deriving from its claimed healing qualities, and *gius* or *giul* because of the viscous nature of the juice (whence the English *glue*).

(The modern Irish word for mistletoe is *drualus*, deriving, obviously, from its association with the druids. *Giul* is not to be found in modern dictionaries (except as a translation for "joule", the unit of energy) while *giúis* signifies the pine tree, which, of course, also has a viscous sap.)

Vallancey goes on to say that the sacred shrub was distributed among the people on the 1st January and thence called *giul-abeirta*, the gift of the mistletoe. It was from the distribution of *giul* at this time that the term *Yule* for the period between Christmas and New Year's Day originated.

Further Reading: Wikipedia Irish Calendar

This article was originally published in *Orbit*, the magazine of the Irish Astronomical Society.

Leviathan Telescope

In 1845 the amateur astronomer, the Earl of Rosse, built a telescope with a lens six feet (72 inches) in diameter. Dubbed the Leviathan, it was easily the largest telescope of its day. While Rosse was applauded for his efforts, however, the results he achieved were less than stellar. The problem? He built it in Ireland - where the weather was so bad he could hardly ever use it.

Early astronomers tried to compensate for poor lenses with exceptionally long telescopes. In the 17th century, for example, the French astronomer Adrien Auzout briefly considered building an instrument one thousand feet long - with which he hoped to observe animals walking on the moon.

Scratch That

Although Carl Sagan enjoyed eating as much as the next famous astronomer, he never produced an apple pie to his satisfaction. "To make an apple pie from scratch," he once declared, "you first must create the universe."

Google Earth Review

By Gary Nugent

We've all seen satellite images of Earth and some stunning images have been reproduced in expensive coffee-table books. If you're like me, you've envied any astronaut's view of our planet from above. Some appreciation of what they were able to see was provided early this century (!) with the release of a software tool by Keyhole Corp which allowed anyone with an nVidia graphics card and a fast internet connection to zoom in on a 3D Earth for close-up views of the planet.

Founded in 2001, Keyhole Corp claimed to be the largest 3D, commercial imagery depository online. They maintained a multi-terabyte database of digital images of geographic locations captured from satellites and aeroplanes. Its 3D technology provided far-away or close-up views of a region, neighbourhood or specific address. Images could be tilted into different positions, and its image resolution in some areas is as fine as half a foot. Keyhole's 3-D maps were used to zero in on the battlefront on CNN news during the early days of the Iraq war.

Their downloadable product was called EarthViewer 3D and, for a fee of between $50 and $600 per year, anyone could access the high quality imagery they provided.

In October 2004, Google bought the company.

The Keyhole database includes thousands of cities, and images varying in age from two months to three years. It gets these images from a variety of sources, including the private Colorado satellite companies DigitalGlobe and Space Imaging, while some lower-resolution images come from the U.S. government.

One of the first things Google did after the buyout, was to slash the price of Keyhole 2 LT (the renamed Earth-

Viewer 3D application), the basic consumer downloadable software by a whooping 57%, reducing it from $70 (~£38/€56) to $30 (~£16/€24). The more sophisticated Keyhole 2 Pro was priced at $599 (~£327/€480).

Not ones to rest on their laurels, Google announced that they would be releasing a free version of the software in the then not too distant future. On June 28th, Google launched the highly anticipated full version of Google Earth, it's renamed application. The 10Mb download is available from http://earth.google.com.

The software is a standalone application that's essentially an enhanced and upgraded version of the earlier Keyhole 3D satellite imagery product. As Google has done with several of its past acquisitions, the company has also made the application free to all users, dropping its annual subscription fee for the basic version. Google Earth Plus with additional features will cost $20 per year. This isn't something I've subscribed to yet but I probably will.

So What Does It Do?

This geographical search tool combines local search with satellite images and maps from around the globe.

Imagine yourself in a fast-moving spaceship that can fly to any point over Earth and look down on the landscape below from any height. That's what Google Earth lets you do. Currently, the software has detailed imagery for the U.S., Canada and the U.K. and 38 major cities in other countries, as well as medium to high resolution terrain imagery for the entire world.

Google Earth view of Meteor Crater in Arizona, USA.

It is presented as a console with controls allowing you manipulate 3D satellite imagery of the Earth in a viewer directly above the controls (see image on previous page). When you first start the application, your view is of the entire globe. You can either use the controls or Google Earth's search functions to zoom in on a specific location.

The program lets you do smooth flybys of the entire Earth. Click and drag the map to get it rotating in whatever direction you like. The faster you drag, the faster the rotation of the planet. Clicking anywhere on

Google Earth tilted view of Niagara Falls

a rotating map, halts the rotation.

You can easily fly to any spot on the globe, by entering any associated data, like street addresses, place names or latitude and longitude coordinates. Fly-tos typically stop at an altitude of about 3000 feet and from this point, the console controls are used to zoom, tilt, pan or rotate the view. Images are initially low resolution, but once the fly-by stops, Google Earth starts dowloading higher resolution imagery from the internet (so a fast internet conneciton is recommended).

Overlays (that can be turned on or off using the checkboxes provided) put additional information on the map, like roads, international boundaries, terrain, 3D buildings, crime statistics, schools, stadiums, any number of interesting stuff.

It's also possible to overlay data points of geographic interest over images using additional layers. These include shopping areas, gas stations, stadiums, schools and churches, crime statistics, volcanoes, earthquakes... lots of interesting information, to say the least.

You can do Local searches in the program, with icons on the map and a display on the side showing your results. This feature works just like Google Local, accepting a business type and a location in search fields. Local search currently works for businesses in the U.S., Canada and the U.K only.

The results from local searches are displayed with icons on the satellite images and as a list of text results beneath the search box at the left of the screen. Clicking a result opens a balloon pop-up with some more information about the business, including options to get more local search results or driving directions to or from the location. A link is also provided to get a printable view of the search results from Google Maps.

Driving directions are provided to and from places in the U.S. Canada, and western Europe with the Directions search. Detailed directions are displayed beneath the search box, and the viewer displays your route overlaid on an image - you need never get lost again!

Seattle, Washington: Tilted view showing 3D buildings with the Space Needle just left of centre, Optional overlays for lodgings, restaurants, coffee houses, pharmacies, etc. Have been enabled.

A handy new feature lets you fly along the route, allowing you to see exactly what it looks like.

Points of Interest

You can put virtual pins on the maps (called placemarks) so you can remember where all sorts of places are and you can email them to friends from within the application if you come across something interesting (assuming they have Google Earth installed) - if not you can email a JPG instead. Searches and placemarks can be saved as bookmarks in "My Places". Everything can be output in an XML format called KML, that will allow the vast popularity of Google Maps to continue in Google Earth.

Take a look at the thousands of interesting layers and views have been created by the Keyhole Community, that are available for download in KML format.

Many of these views have been created by people annotating favorite destinations or those writing about the community they live in.

What You Need To Run It

Google Earth is a 3D application that not all computers can run. It also requires an internet connection, and a fast one at that, so a broadband connection is necessary. If you have a 56k modem, you might just be able to play with Google Earth, but be prepared for some long download times.

Google Earth will not run on:

Apple Macintosh computers are not supported at this time (but they are working on it).
Windows-based desktop PCs older than 4 years old may not be able to run it.
Windows-based notebook PCs older than 2 years old may not be able to run it.

Minimum configuration:

Operating system: Windows 2000, Windows XP
CPU speed: Intel® Pentium® PIII 500 MHz
System memory (RAM): 128MB
200MB hard-disk space

3D graphics card: 3D-capable video card with 16MB VRAM
1024x768, 32-bit true color screen
Network speed: 128 kbps ("Broadband/Cable Internet")

Recommended configuration:
Operating system: Windows XP
CPU speed: Intel® Pentium® P4 2.4GHz+ or AMD 2400xp+
System memory (RAM): 512MB
2GB hard-disk space
3D graphics card: 3D-capable video card with 32MB VRAM or greater
1280x1024, 32-bit true color screen
Network speed: 128 kbps ("Broadband/Cable Internet")

If You Want To Upgrade

As I mentioned above, Google Earth Plus has a few additional features available to subscribers for $20 per year. These features include:

- ∑ Higher resolution imagery, for better prints or use in PowerPoint presentations
- ∑ GPS support, which can use data from GPS devices such as those made by Garman or Magellan
- ∑ More sophisticated annotation capabilities, with the ability to draw objects on the surface of the earth, highlight an area and so on.

To access these features, all you need do is select the "upgrade" option from the menu in the free version of Google Earth.

Finally

Google has put together a Google Earth Sightseeing page with images of famous landmarks, and the KMZ files that will get you there.

I happened across this by accident in my Google Earth travels. If you know what it is, maybe you'd let me know!

For optimal performance, Google Earth advises that you run the latest available graphics card driver software available from your graphics card manufacturer or PC manufacturer. Following are some common graphics driver download sites:

NVIDIA Drivers
Intel Drivers
ATI Drivers

The First Legal Tender Coin Minted With A Meteorite

By Mark Bostick

One of the questions I get the most is: "Do you want to buy my suspected meteorite?" The answer is generally "No". The next most popular question I get is: "Do you have any of the NWA 267 coins for sale?" This answer is also "No". In 2004, I supplied several kilograms of the meteorite, NWA 267 (or North West Africa 267), to a Liberian company in which they made the first legal tender coin minted with a meteorite. I was given an option to purchase several of the coins early on, but chose to pass. This decision I would later regret. Granted, I didn't know it would be a large silver coin, or that it would be struck legal tender. Still, it would be nice to say, "Yes, I do have a few of the coins in stock."

NWA 267 155.3 grams

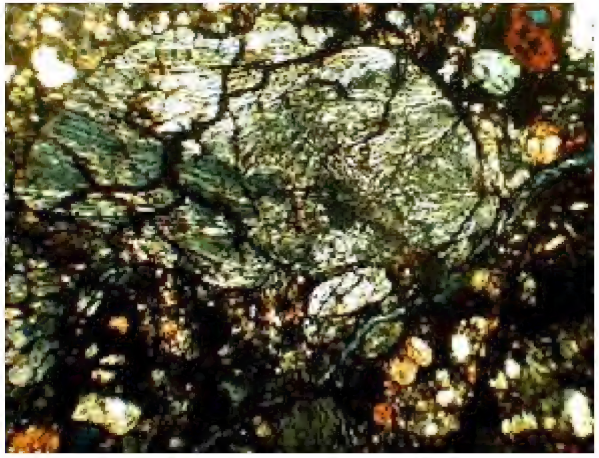
NWA 267 was once a pile of weathered unclassified meteorite fragments brought to the 2000 Denver show by a Moroccan fossil dealer. These fragments, 73.9 kg. worth, where purchased by Canadian meteorite dealer Dean Bessey, who was told the following on the meteorites:

"A nomad found an area with a lot of unusual strange stones near the Morocco/Algeria border. He brought one to a fossil dealer and asked: "I hear that you will pay money for stones like this". After shaking his head in disbelief at a positive response, the nomad gathered up all his camels, wives and children and brought them into the desert to search over his personal strewn field." Or at least that is how the story goes. Many thousands of stones, 73.9 kilograms, were recovered, most of these fragments under 20 grams.

356 grams and a thin section of the meteorite was donated to the Vernadsky Institute of Geochemistry and Analytical Chemistry, part of the Russian Academy of Sciences, Moscow, where it was classified by M. Ivanova. This meteorite, an ordinary stone chondrite, H4 class has a Shock Rating of 2 and a Weathering Grade of 2-3. Fa mol% (olivine) 17.5 , Fs mol% (pyroxene) 17.1. Classification information published in Meteoritical Bulletin 85.

The photo below is from a NWA 267 Meteorite thin section in my collection. Thin sections are used in earth geology, and in meteorites to identify the minerals in them. This photo shows a large imperfect elongated chondrule. Chondrules are unique features to meteorites. The chondrule shown below is composed of mostly pyroxene and the bright colored minerals scattered throughout the thin section is mostly olivine.

The NWA 267 meteorite coin was the handiwork of Coin Invest Trust and was the child of Reinhard Sinn, the Manager of International Projects. Sinn, a man with many interests, had purchased a number of small meteorites before approaching me with the idea. At this stage he was unsure if the board would give it a go, but he seemed excited about the thought. Coin Invest



NWA 267 Meteorite Thin section

NWA 267 Meteorite Coin, Obverse Side

NWA 267 Meteorite Coin, Reverse Side

Trust had already minted a number of unique items, like the first hologram coin that is legal tender.

The project got a go and in 2004, Coin Invest Trust minted 999 $10.00 proof coins, each contained two ounces of 0.999 silver, and a decently large cavity in which small fragments of the NWA 267 meteorite were placed. The coin shows a nomad on a camel while a meteorite is falling through the star-studded sky. A sand dune holds a treasure pile of meteorites waiting to be found. The reverse side of the coin has a seal of the Liberian Government and notes its ten dollar value. The diameter of the coin is a large 50 mm and it has a reeded edge. By comparison, the Eisenhower Dollar, the last big U.S. Dollar coin is 38.1 mm. The NWA 267 coin is also a thick 4 mm, while the Eisenhower Dollar is a little over 2mm.

This unique coin retailed at $199 and came in a cherry wood box with a Certificate of Authority (COA), and a small sample of the meteorite. A few coins were sold with only the COA. The coins flew out the door and sold out within a couple weeks. In fact, a couple orders had to be allocated. Something I hope will encourage Coin Invest Trust to create another meteorite coin. Coins are one of the most collected items. They could be a great promotional vehicle for meteorites.

The certificate of authenticity is titled, "CERTIFICATE METEORITE COIN". Opened, the certificate has information on the coin on the left side, and information on the meteorite on the right side. The meteorite information is in my handwriting, and at the bottom is my name and signature, which explains why I get so many of the "Do you have any NWA 267 coins for sale?" questions.

To be honest I was surprised to see my name and signature on the certificates. I do not mind of course, and perhaps feel a little flattered, but I don't want to appear as taking credit. It is a beautiful coin and I am honored to have played a small part in its production.

Meteor!

Though Thomas Jefferson did important scientific work (experimenting, for example, with new varieties of grain and studying and classifying various fossils), he refused to believe in meteorites. One day, it was reported that two professors had seen a meteorite land in Connecticutt. Jefferson remained unconvinced. "I would rather believe that two Yankee professors would lie," he declared, "than that stones fall from the sky."

MARS or Bust

Where I'm from got me in trouble...

My son and I were en route to a music store called MARS, the musicians resource. It's a huge discount store selling guitars and amps and stuff. We were on 71 North when I saw something that looked like an airplane coming down in flames. Then I realized it wasn't coming down.

It continued across the sky from the west to the east, throwing off flaming debris in green, red, and yellow colors, and seemed to move rather slowly across the sky.

Traffic on the freeway literally stopped. People pulled over and climbed out of their cars to stare at it in amazement. When we finally got to MARS, I immediately called the local television station and asked if they had been getting reports about a fireball.

The woman who answered said that they were swamped with calls.

I told her that I was an amateur astronomer and could probably give her a fairly objective description of the fireball.

"That's great!" she said. "Exactly where were you when you saw it?"

"We were on our way to MARS," I said.

She hung up on me.

- Larry Brown

The Perils of Astronomy

I once was out observing alone at Grant Ranch (on the way to Mt. Hamilton). The shadowy figures moving around in the nearby field revealed themselves in my binocular to be wild pigs. More spooky were the coyotes. They were howling from the hilltops in all directions around me. I could just imagine how they might be calling each other's attention to the lone unarmed human down there. Then I heard a gunshot that seemed to come from a mile or so down the highway. Then another and another. I thought to myself, "A rancher must have had enough of the coyotes." But then a voice came from a megaphone in that direction, saying, "Police! Come out with your hands up!" And shortly later, "All right, is that all of you?"

My big mistake was in relating the story to my wife the next day. She put her foot down and wouldn't let me go out alone after that.

- David Smith

Life in the Freezer

January 1985 ... installing SPOT (South Pole Optical Telescope) in its shelter at the South Pole ... On the roof assembling the "periscope" optical head ... removed some screws ... where to put them? Roof is covered in thin blown snow ... Yes of course ... between my lips ... Whoops ... -its -32C ... ... sorry for the pause, it was about 5 minutes before I was able to dump enough heat into those little screws to unfreeze my lips. (Boy was I glad it wasn't those carraige bolts!

- John Oliver

The Great Astronomers

Today, most astronomers believe that the universe began with a huge explosion. The person responsible for highlighting this theory was a former pugilist, Edwin P. Hubble

By Tim Carr

Today, most astronomers believe that the universe began with a huge explosion of all the matter that exists. That matter slowly condensed and evolved into stars, galaxies and (in our case) the planet on which we live. The Big Bang theory was first proposed by Abbe George Lemaitre in 1927, but it was someone else who made people believe it and shaped the course of astronomy for most of the century.

Edwin Powell Hubble was born in Marshfield, Missouri in 1889. After attending the University of Chicago, where he concentrated on astronomy and mathematics, he became a Rhodes Scholar at Queen's College, Oxford, obtaining a degree in Law. He practiced law for a short period, in Kentucky, before returning to his native Chicago to carry out research at the famous Yerkes Observatory in 1914. Apart from a stint serving at the end of World War I, Hubble spent the rest of his life working there, using their enormous new 100-inch reflector. History would show that he would use it well.

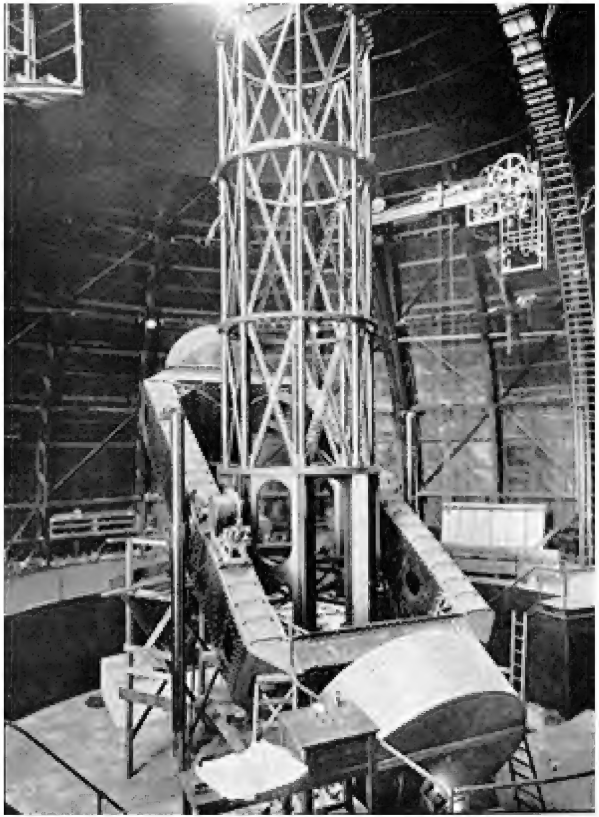
Edwin Hubble

The Big Question

One of the great questions facing astronomers at that time was just how big the universe actually was. It was known that the Sun was just one star in a huge, disc-shaped collection called the Milky Way. But was that it? Or were some of those fuzzy patches of light that could be seen in telescopes really a part of our star system? Were some of them not perhaps galaxies themselves? Some important work in this area had already been done by such people as Henrietta Leavitt, Harlow Shapley, Henry Russell and Ejnar Hertzsprung.

In the early 1910s, Henrietta Leavitt had studied giant, highly luminous stars, known as Cepheid Variables, whose brightness varies. Those she chose to study were in the Magellanic Clouds (two satellite galaxies of our own Milky Way visible in southern skies). In 1912, she was able to show that a relationship existed between the length of time the star took to brighten and fade down again, (its period), and its apparent magnitude (how bright it appeared to be in the sky). She used the Magellanic Clouds because the Cepheids are relatively close to each other, but still lie at a great distance from Earth. Hertzsprung and Shapley were then able to use this relationship to figure out the Absolute Magnitude (the real brightness) of the stars. By comparing how bright it appeared to be with its actual brightness, they could get a pretty good idea as to its distance from us. The results were astonishing. The Magellanic Clouds were nearly 100,000 light years away.

In the 1920s, Hubble began in earnest to examine many of these deep sky objects. Probably the most famous of them is the Andromeda Galaxy (M31). On a really clear night, you can see it with the naked eye. Hubble was able to study Andromeda with the great 100-inch reflector in such detail that by 1923 he could identify no less than 12 Cepheid Variables in it. Using the techniques pioneered by Leavitt, he concluded that the Andromeda Galaxy was 750,000 light years away. (We now know that this estimate was far too low. At the time, it was not realised that there were two types of Cepheid Variable. The distinction between the two types was discovered by Walter Baade in 1952. M31 contained the second type of Cepheid, and a recalculation of the galaxy's distance showed it to be 2,250,000 light years away). Hubble's results showed that no one could possibly be under any illusions that our galaxy was the whole universe. If this fuzzy patch



The 100-inch "Hooker" telescope that Edwin Hubble used to measure the distances to several large "spiral nebula".

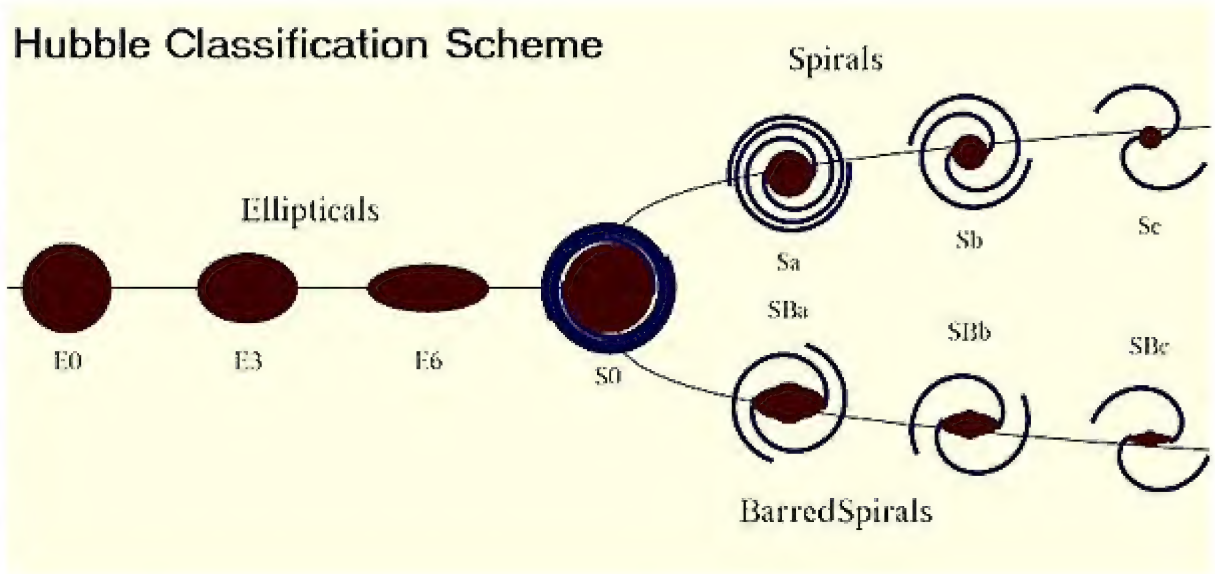


fig.1: The Hubble System classifies three types of galaxies. Ellipticals range from EO to E7; those of EO appear spherical and, as a result, look misleadingly like globular clusters; those of E7 are decidedly elliptical Spirals are of types Sa (large nucleus and tightly wound arms), Sb (smaller nucleus, looser arms), and Sc (small nucleus, loose arms); barred spirals are divided into SBa, SBb and SBc.

of light was so far away, it must truly be a galaxy in its own right.

Over the next few years, Hubble was able to present to the scientific community, a comprehensive picture of the universe that is still largely in use today. It goes like this:

- The universe consists of a huge void in which galaxies are studded like small islands in a vast sea (in fact he referred to galaxies as `island universes'):
- These galaxies come in different shapes and sizes.
- The universe is expanding.

Hubble not only discovered a large number of galaxies, he was able to classify them by their shape (see fig.1). About 97% of them were regular in shape, which meant they were either elliptical or spiral (like the Milky Way). He even subdivided the spiral galaxies into two subclasses - normal and barred. Some spiral galaxies had tightly wound arms, some had looser arms and others were virtually S-shaped. The barred spirals were the same except the arms emanated from a bar crossing the centre of the galaxy.

The irregulars, as their name implies, were galaxies that had no specific shape or structure. There was also a type labeled Sd that was somewhere between spiral and elliptical. The sizes of the galaxies also varied quite considerably.

The Big Bang

Edwin Hubble was not the first person to suggest that the universe was expanding. As is usual in the story of

science, there are always others who think along the same lines. However, nobody had come up with any coherent data to back up such a theory. No one had said in what way it was expanding or at what speed. Hubble did.

According to Hubble, the whole universe was expanding every part of it rushing away from every other part, and the farther away a galaxy is, the faster it is receding from us. He was able to show this by examining the spectral lines of light collected from each galaxy. These lines were shifted towards the red end of the spectrum, showing that the source of this light was moving away from us. (A similar effect is noticed when an ambulance siren changes pitch as it passes you. It is known as the Doppler Effect). Hubble got these results for all the galaxies he studied, so it was obvious that no matter where he looked, the universe was moving away from us.

The only explanation for these results was that sometime in the past, all the matter in the universe was condensed into a very small area. Something then triggered a truly huge explosion that caused the fabric of space itself to expand. As it expanded, this matter evolved into galaxies, stars, planets and even people. Remember that it is the fabric of space that is getting larger, rather than the galaxies themselves just flying independently through space. Think of it like this.

Imagine the galaxies in our universe as raisins in a loaf of bread. As the bread bakes in the oven, the dough rises, carrying each raisin away from every other raisin. Likewise, as the universe expands, the distances between the galaxies increases. Not content with all this, Hubble said that the speed at which a galaxy was receding from us was directly proportional to its distance. This proportionality is known as the Hubble Constant.

His measurement techniques produced a value of about 50 km per second per megaparsec. (One parsec = 3.26 light years. Megaparsec = 1,000,000 parsecs). What all these numbers simply mean is that if two galaxies are 10 megaparsecs (32,600,000 light years) apart, they are moving apart at 500 km per second.

Hubble used the observations to compile a 'map' of the universe, showing the distribution of the galaxies. Knowing their speed of recession, he could work back to the point when they were still 'clumped' together. He concluded that the universe was about 2 billion years old. However, geologists knew that the Earth was older than Hubble's assessment. The best current estimate for the age of the universe is 13.7 billion years (+/- 200 million years).

Of course, if the galaxies are moving faster and faster away from us as we look farther into space, then the ones that are extremely distant must be receding at an incredible speed indeed. In fact, the furthest galaxies are receding at almost the speed of light. Any that are much more distant are moving so fast that their light will never reach us. This marks the boundary of the observable universe. If anything lies beyond it, we don't know what it is, and probably never will.

Hubble's private life was quite normal. During World War II, he was a ballistics expert for the War Department, and he was awarded numerous scientific accolades during his career. Despite a heart condition, he remained active until his old age, even working on the design and construction of the Mount Palomar Observatory. He died quietly in September 1953.

A measure of just how profound was his contribution to our view of the universe, can be judged by the fact that when NASA launched the space telescope, they named it after Edwin Hubble.

Hubble's Bazooka

Edwin Hubble's exploration of the cosmos was interrupted by World War II. The famous astronomer signed on as head of ballistics at Aberdeen Proving Ground in Maryland, where he once spent an afternoon test-firing bazookas, at great personal risk, to pinpoint a design flaw.

Submissions

I'm looking for submissions for the next and future issues, whatever part of the world you live in.

The first six issues should give you a flavor for the kind of articles I'm looking for. Talk about any astronomical trips you've been on, whether they're to local or national Star Parties or vacations based around an astronomical event such as a solar eclipse. Give warts-and-all reviews of equipment you own, from a lowly pair of binoculars, to eyepieces to large expensive telescopes. Let readers know what you think of recent books on astronomy or your appraisals of astronomy software, whether they're freeware, shareware or commercial applications; profile your club or society; talk about any equipment you've built or modified, about your experiences with astrophotography and send in some of your results. As of this issue (Issue 7) contributors will receive payment for their material.

Please include any photos or illustrations with your submission. You should own copyright on any photos submitted (i.e. you've taken the photos yourself) or have obtained permission from the copyright owner.

As an aid to production, it would be appreciated if material submitted was emailed to the Editorial email address (in either Word .DOC or .RTF format or as a text file). Please do not format the text (as I'll have to reformat it to suit Photon) and send photos as email attachments rather than embedded in documents. Where this is impossible, articles should be provided in hardcopy format (typed or printed) and mailed to the Editorial (snail) mail address. Submissions on floppy disk or CD can also be sent to that address. Images should be in .GIF or .JPG format to save on space and bandwidth.

Material received by any means other than email will not be returned unless a submitting author specifically requests the return of material and a stamp addressed envelope or sufficient return postage is included.

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Deadlines

Material for inclusion in **Photon** must be received before the following dates to ensure publication:

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Kitty Astronomy

We name our cats after music pieces and composers, so one of our favorite cats was named Brandenburg. One evening, after finishing a figuring spell on my 24" in the kitchen, the mirror was sitting on its grinding table face up, a few feet from the fridge. The top of the fridge was one of Brandenburg's favorite haunts. Down he leaped, claws outstretched, skidding across the mirror face without so much as the slightly slowing, and toppled off the other end onto the floor.

Another time, I found Zeus starring intently into the 10" primary of my fork mounted scope, angrily trying to scare off this cat that looked so much like him. I had to tip the tube completely upside down to get him to slide out ever so reluctantly.

-Mel Bartels

I was wondering why the my 8" reflector was starting to move in declination while looking through the eyepiece. Did I fail to clamp it hard enough? No, a cat had climbed from an adjoining fence into the open end of the tube, causing a much more serious obstruction than the worst diagonal ever could.

As you know, cats rub against your legs because they are hungry. (And you thought it was love?) One of my neighbor's cats first rubbed against my legs, then when she discovered that I wouldn't give her food, she started rubbing against my tripod's legs. What was she expecting? Little chunks of glass?

-Clayton E. Cramer

Big Bang

Though many astronomers endorsed George Gamow's theory that the universe had begun in a massive explosion and had been expanding ever since (a notion supported by observations made by Edwin Hubble in the 1920s), Fred Hoyle (like Thomas Gold and Hermann Bondi) rejected the idea. They simply refused to believe that the universe had a beginning (and, presumably, would have an end), preferring to think of space as homogeneous; as galaxies moved apart, he believed, new matter appeared to maintain a sort of equilibrium (the so-called "steady state" theory).

As the debate intensified, Hoyle sarcastically began to refer to Gamow's theory as a "Big Bang" - and was astonished when his insulting phrase became the commonly accepted term.

Showcase

If you have images/photos, please consider sending them in.

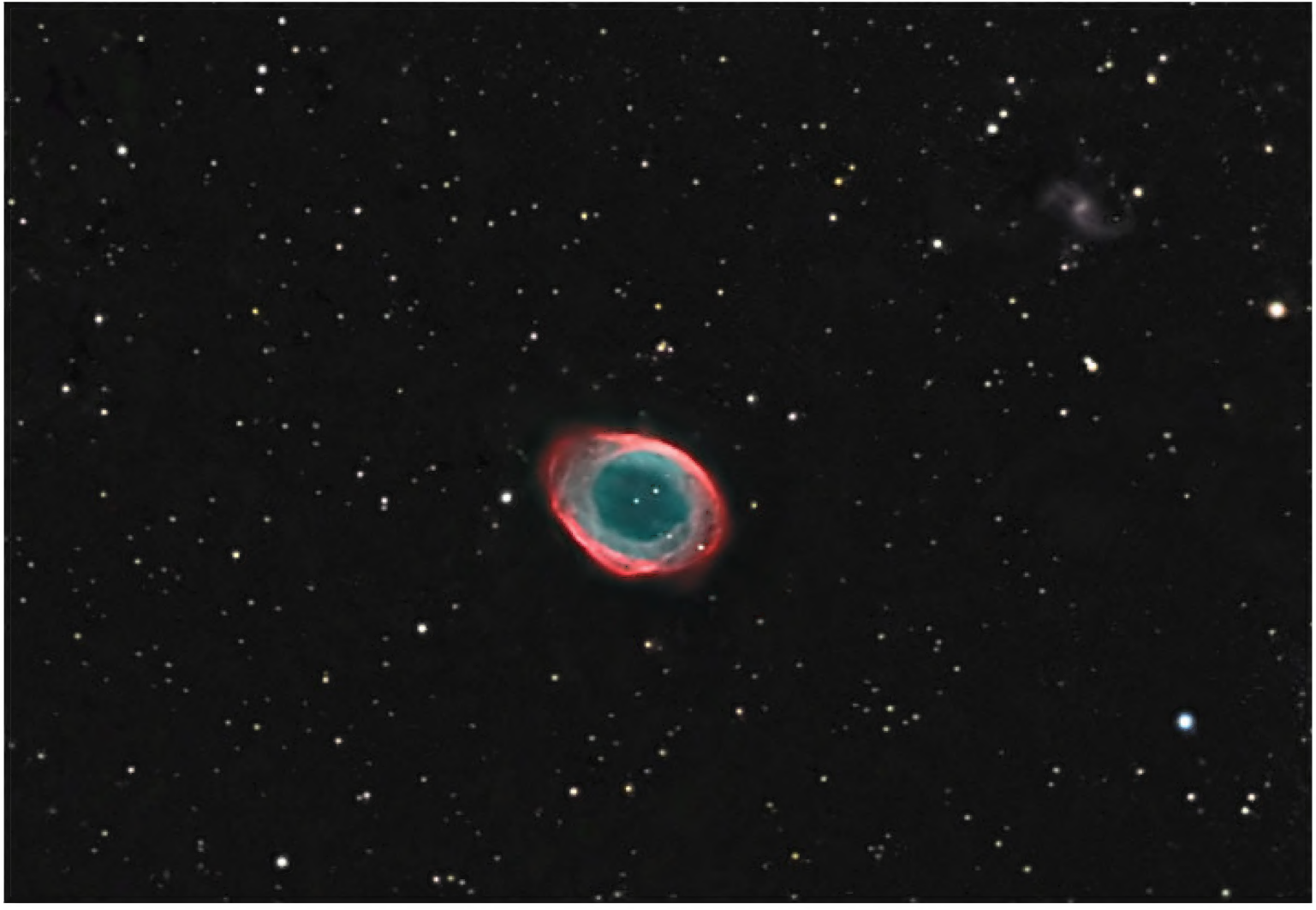
Cover Picture: M17 - The Swan Nebula. Date: June 17 & 18, 2005. Telescope: Celestron C14 f/6.73 ; Camera: ST-10XME/AO7; Filters: Astrodon TruBalance; Exposure: L = R = 80 min. R G & B = 30 min. each. M17, also called the Swan Nebula and sometimes the Omega Nebula, is a region of star formation and shines by excited emission caused by the high-energy radiation of young stars. Unlike many other emission nebula, however, these stars are not obvious in optical images, but are hidden in the nebula. Star formation is either still active in this nebula, or has ceased very recently. A small cluster of about 35 bright but obscured stars seems to be imbedded in the nebulosity.

The color of the nebula is reddish, with some graduation to pink. This color comes from hot hydrogen gas excited to shine by stars lying within the nebula. The brightest region, however, is actually of white color, not overexposed as one might think. This phenomenon is apparently a result of a mixture of emission light from the hottest gas, together with reflections of the bright star light from the dust in this region. The nebula contains a large amount of dark obscuring material, which is obvious in its remarkable features. The mass of the gas in the nebula is estimated to be about 800 times that of the Sun.

While the bright nebula seems to be roughly 15 light years across, the total gaseous cloud, including low-luminosity material, extends to at least 40 light years. M17 is estimated to be 5,000 to 6,000 light years distant.

Left: Gibbous Moon, 21:09 UT Feb. 18, 2005. Taken with a Canon EOS 300D and a 650-1300mm telephoto lens (mated with a T-Adapter) at 1300mm and f/16. Crater Copernicus is left of centre above the terminator. Bullialdus is right of centre. Blancanus and Newton are the two prominent side-lit craters at far right above the terminator.

Bottom: M57 in Lyra. Telescope: Celestron C14; Mount: MI-250; Filters: AstroDon Tru-Balance CRGB; Camera: SBIG ST-10XME/AO-7; Exposure: L = 90 min. R, G & B = 30 min. Each.



M57 was discovered by Antoine Darquier de Pellepoix in 1779. The famous Ring Nebula (M57) is often regarded as the prototype of a planetary nebula, and a showpiece in the Northern Hemisphere summer sky. Recent research has confirmed that M57 is, most probably, a ring (torus) of bright light-emitting material ejected from its central star. Our view of M57 is from a polar vantage point. We therefore are looking down the axis of a cylinder of ejected gas. Viewed from the equatorial plane M57 most likely would resemble the Dumbbell Nebula (M27) or the Little Dumbbell Nebula (M76).

The small galaxy in the upper right of the image is IC 1296. It is relatively faint and has an apparent magnitude of 15.